ADSP-2191 EZ-KIT Lite®
Evaluation System Manual

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Analog Devices, Inc.
One Technology Way
Norwood, Mass. 02062-9106

ANALOG DEVICES

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The ADSP-2191 EZ-KIT Lite evaluation system has been certified to comply with the essential requirements of the European EMC directive 89/336/EEC (inclusive 93/68/EEC) and, therefore, carries the “CE” mark.

The ADSP-2191 EZ-KIT Lite evaluation system had been appended to the Technical Construction File referenced “DSPTOOLS1” dated December 21, 1997 and was awarded CE Certification by an appointed European Competent Body as listed below.

Technical Certificate No: Z600ANA1.006

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

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.

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PREFACE

Thank you for purchasing the ADSP-2191 EZ-KIT Lite® evaluation system. The evaluation board is designed to be used in conjunction with the VisualDSP++ development environment to test the capabilities of the ADSP-2191 fixed-point digital signal processor (DSP). The VisualDSP++ development environment gives you the ability to perform advanced application code development and debug tasks such as:

- Create, compile, assemble, and link application programs written in C++, C and ADSP-2191 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-2191 processor from a personal computer (PC) is achieved through a USB port or an optional JTAG emulator. The USB interface gives unrestricted access to the ADSP-2191 processor and the 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 DSP development tools, go to:

```
http://www.analog.com/dsp/tools/
```

ADSP-2191 EZ-KIT Lite provides example programs to demonstrate the capabilities of the evaluation board.

The VisualDSP++ license provided with this EZ-KIT Lite evaluation system limits the size of a user program to 8K words of internal memory.

The board's features include:

- Analog Devices ADSP-2191 processor
  - 160 MHz Core Clock Speed (default)
  - Core Clock Multiplication Factor Selection Switch
- USB Debugging Interface

This is not the DSP's USB interface.

- Analog Devices AD1885 48 kHz AC'97 SoundMAX® Codec
  - Jumper-Selectable Line-In or Mic-In 3.5 mm Stereo Jack
  - Line-Out 3.5 mm Stereo Jack
- Analog Devices AD1803 Low-Power Modem Codec
  - RJ-11 Telephone Line Connector
  - Rx and Tx LEDs
- Flash Memory
  - 512K x 8
- Interface Connectors
  - 14-Pin Emulator Connector for JTAG Interface
  - SPORT0 and SPORT1 Connectors
  - External Memory Interface Connectors (not populated)
  - Host Port Interface Connector (not populated)

- General-Purpose IO
  - 2 Push Button Inputs
  - 4 LEDs Outputs
- Analog Devices ADP3338 and ADP3339 Voltage Regulators
- Breadboard area with typical SMT footprints

The EZ-KIT Lite board has a Flash memory device that can be used to store user specific boot code. By configuring the jumpers (SW1 switch) and by programming the Flash memory, the board can run as a stand-alone unit. For information about using the Flash memory, see "Using Flash Programmer Utility" on page 2-5.

SPORT0 is interfaced with an audio codec, allowing you to create audio signal processing applications.SPORT1 is connected to a telephony codec allowing you to interface with a telephone line. Both SPORTs are attached to off-board connectors to connect to other serial devices.

Additionally, the EZ-KIT Lite board provides un-installed expansion connector footprints that allow you to connect to the processor's External Memory Interface (EMI) and Host Port Interface (HPI).

Purpose of This Manual

The *ADSP-2191 EZ-KIT Lite Evaluation System Manual* provides instructions for using the hardware and installing the software on your PC. This manual provides guidelines for running your own code on the ADSP-2191 EZ-KIT Lite. The manual also describes the operation and configuration of the evaluation board's components. Finally, a schematic and a bill of materials are provided as a reference for future ADSP-2191 board designs.

Intended Audience

This manual is a user's guide and reference to the ADSP-2191 EZ-KIT Lite evaluation system. Programmers who are familiar with the Analog Devices ADSP-2191 processor architecture, operation, and programming are the primary audience for this manual.

Programmers who are unfamiliar with Analog Devices Blackfin processors can use this manual in conjunction with the *ADSP-219x/2191 DSP Hardware Reference* and the *ADSP-219x DSP Instruction Set Reference*, which describe the processor architecture and instruction set. Programmers who are unfamiliar with VisualDSP++ should refer to the VisualDSP++ online Help and the VisualDSP++ user's or getting started guides. For the locations of these documents, refer to "Related Documents" in this "Preface."

Manual Contents

The manual consists of:

- Chapter 1, "Getting Started" on page 1-1

  Provides software and hardware installation procedures, PC system requirements, and basic board information.

- Chapter 2, "Using EZ-KIT Lite" on page 2-1

  Provides information on the EZ-KIT Lite from a programmer's perspective and provides an easy-to-access memory map.

- Chapter 3, "EZ-KIT Lite Hardware Reference" on page 3-1

  Provides information on the hardware aspects of the evaluation system.

- Appendix A, "Bill Of Materials" on page A-1

  Provides a list of components used to manufacture the EZ-KIT Lite board.

- Appendix B, "Schematics" on page B-1

  Provides the resources to allow EZ-KIT Lite board-level debugging or to use as a reference design.

  This appendix is not part of the online Help. The online Help viewers should go the PDF version of the *ADSP-2191 EZ-KIT Lite Evaluation System Manual* located in the `Docs\EZ-KIT Lite Manuals` folder on the installation CD to see the schematics.

What's New in This Manual

This is the third revision of the *ADSP-2191 EZ-KIT Lite Evaluation System Manual*. The manual provides an updated listing of related documents.

Technical or Customer Support

You can reach DSP Tools Support in the following ways.

- Visit the DSP Development Tools website at

  `www.analog.com/technology/dsp/developmentTools/index.html`

- Email questions to

  `dsptools.support@analog.com`

- Phone questions to 1-800-ANALOGD
- Contact your ADI local sales office or authorized distributor

- Send questions by mail to

```
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Norwood, MA 02062-9106
USA
```

Supported Processors

The ADSP-2191 EZ-KIT Lite evaluation system supports Analog Devices ADSP-2191 processors.

Product Information

You can obtain product information from the Analog Devices website, from the product CD-ROM, or from the printed publications (manuals).

Analog Devices is online at `www.analog.com`. Our website provides information about a broad range of products—analog integrated circuits, amplifiers, converters, and digital signal processors.

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MyAnalog.com is a free feature of the Analog Devices website that allows customization of a webpage to display only the latest information on products you are interested in. You can also choose to receive weekly email notification containing updates to the webpages that meet your interests. MyAnalog.com provides access to books, application notes, data sheets, code examples, and more.

Registration:

Visit www.myanalog.com to sign up. Click Register to use MyAnalog.com. Registration takes about five minutes and serves as means for you to select the information you want to receive.

If you are already a registered user, just log on. Your user name is your email address.

DSP Product Information

For information on digital signal processors, visit our website at www.analog.com/dsp, which provides access to technical publications, data sheets, application notes, product overviews, and product announcements.

You may also obtain additional information about Analog Devices and its products in any of the following ways.

- Email questions or requests for information to dsp.support@analog.com
- Fax questions or requests for information to 1-781-461-3010 (North America) or +49 (0) 89 76903-157 (Europe)

Related Documents

For information on product related development software, see the following publications.

Table 1. Related DSP Publications

Title	Description
ADSP-2191 DSP Datasheet	General functional description, pin-out, and timing.
ADSP-219x/2191 DSP Hardware Reference	Description of internal processor architecture and all register functions.
ADSP-219x Instruction Set Reference	Description of all allowed processor assembly instructions.

Table 2. Related VisualDSP++ Publications

Title	Description
VisualDSP++ 3.5 User's Guide for 16-Bit Processors	Detailed description of VisualDSP++ 3.5 features and usage.
VisualDSP++ 3.5 Assembler and Preprocessor Manual for ADSP-21xx Processors	Description of the assembler function and commands for Blackfin processors.
VisualDSP++ 3.5 C/C++ Complier and Library Manual for ADSP-219x Processors	Description of the complier function and commands for Blackfin processors
VisualDSP++ 3.5 Linker and Utilities Manual for 16-Bit Processors	Description of the linker function and commands for 16-bit processors.
VisualDSP++ 3.5 Loader Manual for 16-Bit Processors	Description of the loader/splitter function and commands for 16-bit processors.

The listed documents can be found through online Help or in the `Docs` folder of your VisualDSP++ installation. Most documents are available in printed form.

If you plan to use the EZ-KIT Lite board in conjunction with a JTAG emulator, refer to the emulator documentation.

Online Documentation

Your software installation kit includes online Help as part of the Windows® interface. These help files provide information about VisualDSP++ and the ADSP-2191 EZ-KIT Lite evaluation system.

To view VisualDSP++ Help, click on the Help menu item or go to the Windows task bar and select Start→Programs→VisualDSP→ VisualDSP++ Documentation.

To view ADSP-2191 EZ-KIT Lite Help, which now is a part of the VisualDSP++ Help system, go the Contents tab of the Help window and select Manuals→ADSP-2191 EZ-KIT Lite.

For more documentation, please go to `http://www.analog.com/technology/dsp/library.html`.

Printed Manuals

For general questions regarding literature ordering, call the Literature Center at 1-800-ANALOGD (1-800-262-5643) and follow the prompts.

VisualDSP++ Documentation Set

Printed copies of VisualDSP++ manuals may be purchased through Analog Devices Customer Service at 1-781-329-4700; ask for a Customer Service representative. The manuals can be purchased only as a kit. For additional information, call 1-603-883-2430.

If you do not have an account with Analog Devices, you will be referred to Analog Devices distributors. To get information on our distributors, log onto `www.analog.com/salesdir/continent.asp`.

Hardware Manuals

Printed copies of hardware reference and instruction set reference manuals can be ordered through the Literature Center or downloaded from the Analog Devices website. The phone number is 1-800-ANALOGD (1-800-262-5643). The manuals can be ordered by a title or by product number located on the back cover of each manual.

Data Sheets

All data sheets can be downloaded from the Analog Devices website. As a general rule, printed copies of data sheets with a letter suffix (L, M, N, S) can be obtained from the Literature Center at 1-800-ANALOGD (1-800-262-5643) or downloaded from the website. Data sheets without the suffix can be downloaded from the website only—no hard copies are available. You can ask for the data sheet by part name or by product number.

If you want to have a data sheet faxed to you, the phone number for that service is 1-800-446-6212. Follow the prompts and a list of data sheet code numbers will be faxed to you. Call the Literature Center first to find out if requested data sheets are available.

Contacting DSP Publications

Please send your comments and recommendations on how to improve our manuals and online Help. You can contact us by sending email to:
`dsp.techpubs@analog.com`

Notation Conventions

The following table describes text conventions used in this manual.

Additional conventions, which apply only to specific chapters, may appear throughout this document.

Example	Description
Close command (File menu) or OK	Text in bold style indicates the location of an item within the VisualDSP++ environment's and boards' menu system and user interface items.
`{this | that}`	Alternative required items in syntax descriptions appear within curly brackets separated by vertical bars; read the example as `this` or `that`.
`[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 ellipsis; read the example as an optional comma-separated list of `this`.
`PF9-0`	Registers, connectors, pins, commands, directives, keywords, code examples, and feature names are in text with `letter gothic` font.
`filename`	Non-keyword placeholders appear in text with italic style format.
Note:	A note providing information of special interest or identifying a related topic. In the online version of this book, the word Note appears instead of this symbol.
Caution:	A caution providing information about critical design or programming issues that influence operation of a product. In the online version of this book, the word Caution appears instead of this symbol.

1 GETTING STARTED

This chapter provides the information you need to begin using ADSP-2191 EZ-KIT Lite evaluation system. For correct operation, install the software and hardware in the order presented in "Installation Tasks" on page 1-3.

The chapter includes the following sections.

- "Contents of EZ-KIT Lite Package" on page 1-1

  Provides a list of the components shipped with this EZ-KIT Lite evaluation system.

- "PC Configuration" on page 1-3

  Describes the minimum requirements for the PC to work with the EZ-KIT Lite evaluation system.

- "Installation Tasks" on page 1-3

  Describes the step-by-step procedures for setting up the hardware and software.

Contents of EZ-KIT Lite Package

Your ADSP-2191 EZ-KIT Lite evaluation system package contains the following items.

- ADSP-2191 EZ-KIT Lite board
- *EZ-KIT Lite Quick Start Guide*

- CD containing:
  - VisualDSP++ for 16-bit processors with a limited license
  - ADSP-2191 EZ-KIT Lite debug software
  - USB driver files
  - Example programs
  - ADSP-2191 *EZ-KIT Lite Evaluation System Manual* (this document)
- Installation Quick Reference Card for VisualDSP++
- Universal 7.5V DC power supply
- USB 2.0 type cable
- Registration card (please fill out and return)

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

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.

PC Configuration

For correct operation of the VisualDSP++ software and the EZ-KIT Lite, your computer must have the minimum configuration:

Windows 98, Windows 2000, Windows XP
Intel (or comparable) 166 MHz processor
VGA Monitor and color video card
2-button mouse
50 MB free on hard drive
32 MB RAM
Full-speed USB port
CD-ROM Drive

EZ-KIT Lite does not run under Windows 95 or Windows NT.

Installation Tasks

The following task list is provided for the safe and effective use of the ADSP-2191 EZ-KIT Lite. Follow the instructions in the presented order to ensure correct operation of your software and hardware.

1. VisualDSP++ and EZ-KIT Lite software installation
2. VisualDSP++ license installation
3. EZ-KIT Lite hardware setup
4. EZ-KIT Lite USB driver installation
5. USB driver installation verification
6. VisualDSP++ startup

Installing VisualDSP++ and EZ-KIT Lite Software

This EZ-KIT Lite comes with the latest version of VisualDSP++ 3.5 for 16-bit processors. VisualDSP++ installation includes EZ-KIT Lite installations.

To install VisualDSP++ and EZ-KIT Lite software:

1. Insert the VisualDSP++ installation CD into the CD-ROM drive.
2. If Autoplay is enabled on your PC, you see the Install Shield Wizard Welcome screen. Otherwise, choose Run from the Start menu, and enter `D:\ADI_Setup.exe` in the Open field, where `D` is the name of your local CD-ROM drive.
3. Follow the on-screen instructions to continue installing the software.
4. At the Custom Setup screen, select your EZ-KIT Lite from the list of available systems and choose the installation directory. Click an icon in the Feature Description field to see the selected system's description. When you have finished, click Next.
5. At the Ready to Install screen, click Back to change your install options, click Install to install the software, or click Cancel to exit the install.
6. When the EZ-KIT Lite installs, the Wizard Completed screen appears. Click Finish.

Installing VisualDSP++ License

To install the VisualDSP++ license:

1. Locate the serial number provided on the sticker affixed to the CD sleeve and the registration form.
2. From the Start menu, choose Programs, Analog Devices, VisualDSP++ 3.5 for 16-bit Processors, VisualDSP++ Environment.
3. The information screen asks if you would like to install a license. Click Yes. The About VisualDSP++ screen appears.
4. Select the Licenses tab and click New.
5. In the Install a New License dialog that opens, select Single User.
6. Fill in the tools serial number in the field provided exactly as it appears on your CD sleeve or registration form and click Next. An information window notifies of successful license installation.

Setting Up EZ-KIT Lite Hardware

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-2191 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.

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 going to step 3.

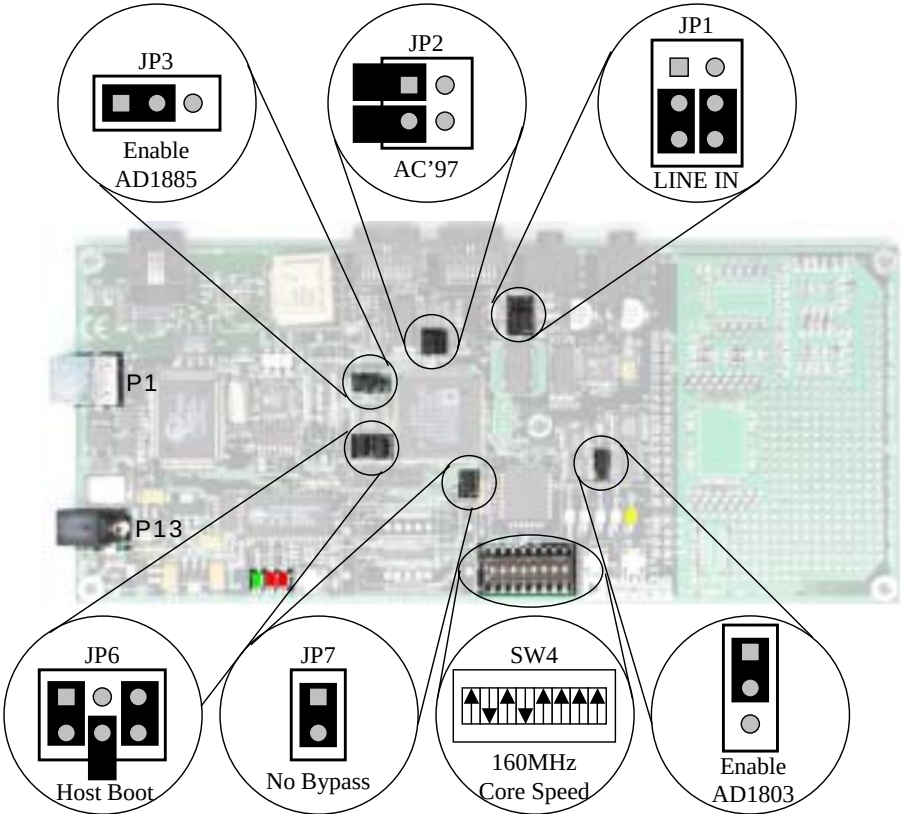

Figure 1-1. Default Jumper Settings

3. Plug the provided power supply into P13 on the EZ-KIT Lite board. Visually verify that the green power LED (LED1) is on. Also verify that the two red reset LEDs (LED2 and LED3) go on for a moment and then go off.

4. Connect one end of the USB cable to an available full speed USB port on your PC and the other end to P1 on the ADSP-2191 EZ-KIT Lite board.

Installing EZ-KIT Lite USB Driver

The EZ-KIT Lite evaluation system installed on Windows 98, Windows 2000, and Windows XP requires one full-speed USB port.

- "Windows 98 USB Driver Installation" on page 1-8 describes the installation on Windows 98.
- "Windows 2000 USB Driver Installation" on page 1-12 describes the installation on Windows 2000.
- "Windows XP USB Driver Installation" on page 1-13 describes the installation on Windows XP.

The USB driver used by the debug agent is not Microsoft certified because it is intended for a development or laboratory environment, not a commercial environment.

Windows 98 USB Driver Installation

Before using the ADSP-2191 EZ-KIT Lite for the first time, the Windows 98 USB driver must first be installed.

To install the USB driver:

1. Insert the CD into the CD-ROM drive.
   The connection of the device to the USB port activates the Windows 98 Add New Hardware Wizard, as shown in Figure 1-2.

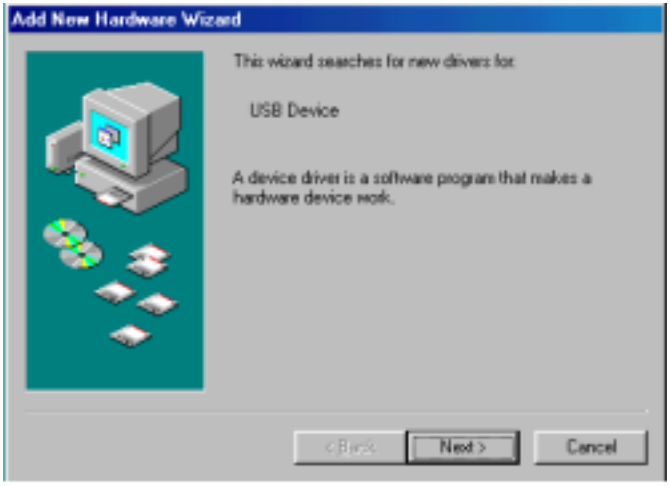

Figure 1-2. Windows 98 – Add New Hardware Wizard

2. Click Next.

3. Select Search for the best driver for your device, as shown in Figure 1-3.

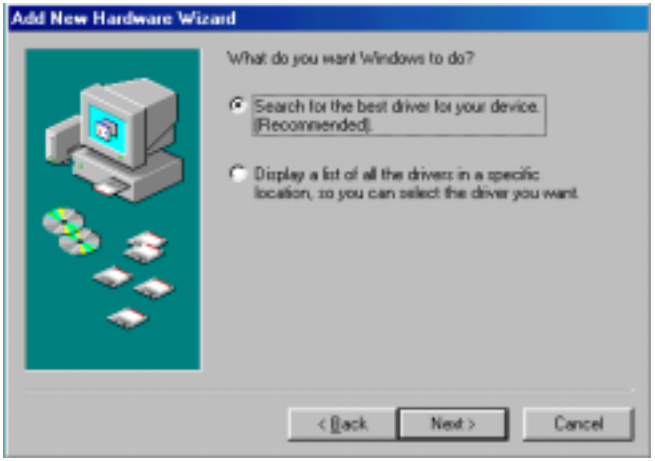

Figure 1-3. Windows 98 – Searching for Driver

4. Click Next.
5. Select CD-ROM drive, as shown in Figure 1-4.

Figure 1-4. Windows 98 – Searching for CD-ROM

6. Click Next.
   Windows 98 locates the `WmUSBEz.inf` file on the installation CD, as shown in Figure 1-5.

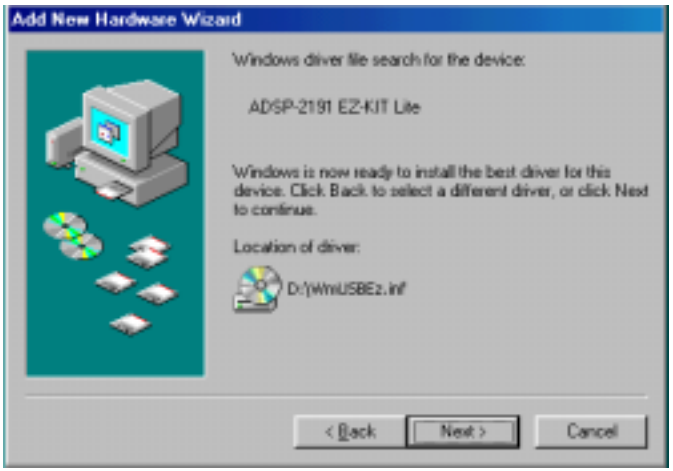

Figure 1-5. Windows 98 – Locating Driver

7. Click Next.
   The Coping Files dialog box appears (Figure 1-6).

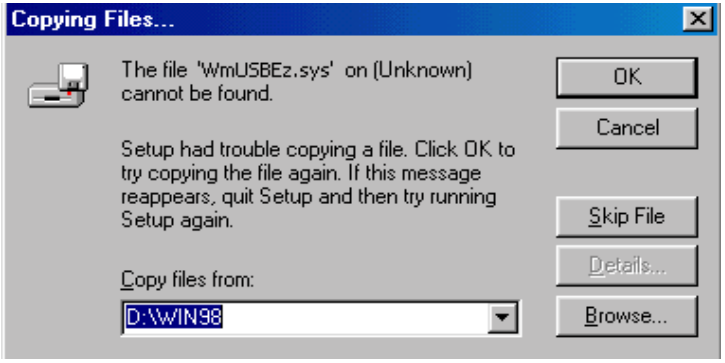

Figure 1-6. Windows 98 – Searching for .SYS File Dialog Box

8. Click Browse. The Open dialog box, shown in Figure 1-7, appears on the screen.

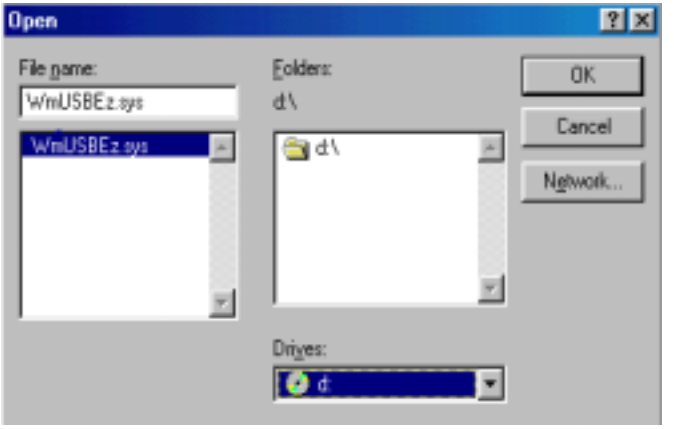

Figure 1-7. Windows 98 – Opening .SYS File

9. In Drives, select your CD-ROM drive.
10. Click OK. The Copying Files dialog box (Figure 1-8) appears.

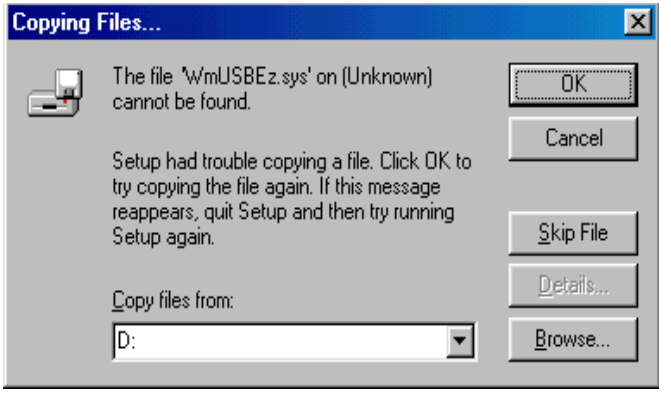

Figure 1-8. Windows 98 – Copying .SYS File

11. Click OK.
    The driver installation is complete, as shown in Figure 1-9.

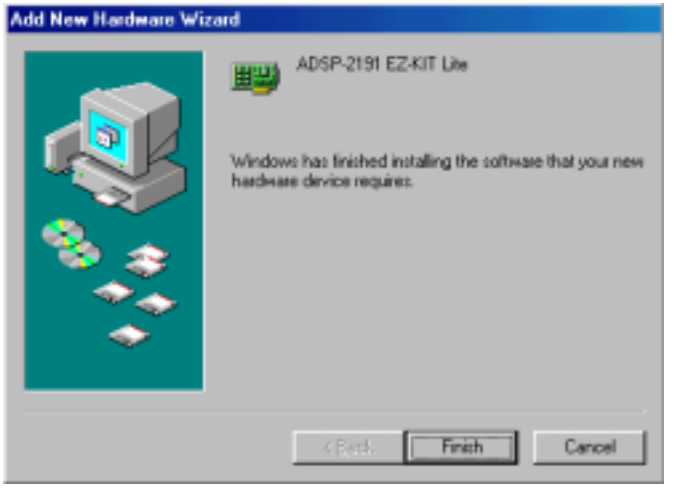

Figure 1-9. Windows 98 – Completing Software Installation

12. Click Finish to exit the wizard.
13. Verify the installation by following the instructions in "Verifying Driver Installation" on page 1-15.

Windows 2000 USB Driver Installation

VisualDSP++ 3.5 installation software pre-installs the necessary drivers for the selected EZ-KIT Lite. The install also upgrades an older driver if such is detected in the system.

Prior to running the VisualDSP++ 3.5 installer, ensure no other Hardware Wizard windows are running in the background. If any wizard windows are running, close them before starting the installer.

To install the USB driver:

1. If VisualDSP++ 3.5 is already installed on your system, go to step 2. Otherwise, insert the VisualDSP++ CD-ROM into the CD-ROM drive and run VisualDSP++ 3.5 installation. Refer to the *Installation Quick Reference Card for VisualDSP++* for a detailed installation description.
   When installing VisualDSP++ 3.5 on Windows 2000, make sure that the appropriate EZ-KIT Lite component is selected for the installation.
2. Connect the EZ-KIT Lite device to your PC's USB port. Windows 2000 automatically detects an EZ-KIT device and automatically installs the appropriate driver for the selected device (see step 1).
3. Verify the installation by following the instructions in "Verifying Driver Installation" on page 1-15

Windows XP USB Driver Installation

VisualDSP++ 3.5 installation software pre-installs the necessary drivers for the selected EZ-KIT Lite. The installation also upgrades an older driver if such is detected in the system.

Prior to running the VisualDSP++ 3.5 installer, ensure there are no other Hardware Wizard windows running in the background. If any wizard windows are running, close them before starting the installer.

To install the USB driver:

1. If VisualDSP++ 3.5 is already installed on your system, go to step 2. Otherwise, Insert the VisualDSP++ CD-ROM into the CD drive and run the VisualDSP++ 3.5 installation. Refer to the *Installation Quick Reference Card for VisualDSP++* for a detailed

installation description.
When installing VisualDSP++ 3.5 on Windows XP, make sure the appropriate EZ-KIT Lite component is selected for the installation.

2. Connect the EZ-KIT Lite device to your PC's USB port.
Connecting the device to the USB port activates the Windows XP Found New Hardware Wizard, shown in Figure 1-10.

Figure 1-10. Windows XP – Found New Hardware Wizard

3. Select Install the software automatically (Recommended) and click Next.
   When Windows XP completes the driver installation for the selected device (see step 1), a window shown in Figure 1-11 appears on the screen.

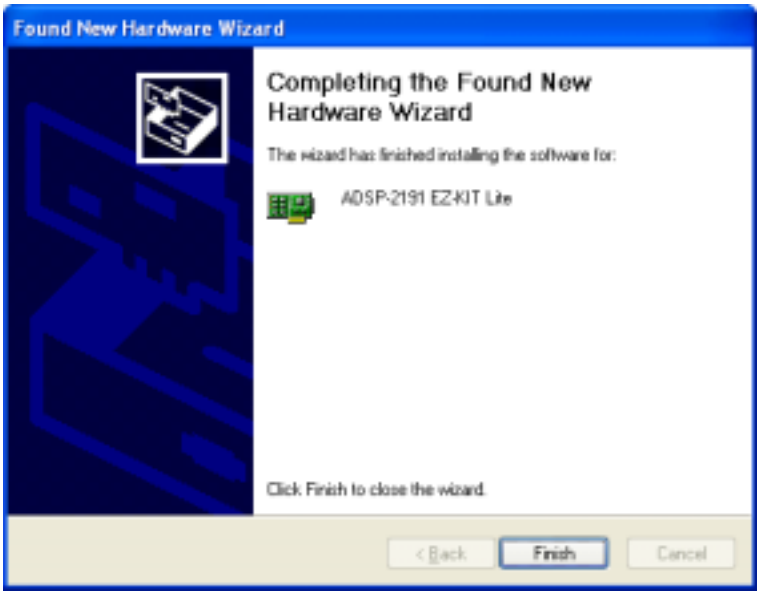

Figure 1-11. Windows XP – Completing Driver Installation

4. Verify the installation by following the instructions in "Verifying Driver Installation".

Verifying Driver Installation

Before you use the EZ-KIT Lite evaluation system, verify that the USB driver software is installed properly:

1. Ensure that the USB cable is connected to the evaluation board and the PC.

2. Press the RESET button (SW1) on the evaluation board.
3. Verify that the red DSP RESET LED (LED3) stays lit for a few seconds.
4. After the DSP RESET LED (LED3) goes out, verify that the yellow USB monitor LED (LED7) is lit. This LED signifies that the board is communicating properly with the host PC and is ready to run VisualDSP++.
5. Open Windows Device Manager and verify that ADSP-2191 EZ-KIT Lite shows under ADI Development Tools with no exclamation point.

If you are using an EZ-KIT Lite on Windows 98, disconnect the USB cable from the board before booting the PC. When Windows 98 is booted and you are logged on, re-connect the USB cable to the board. The operation should continue normally from this point.

Starting VisualDSP++

To set up a session in VisualDSP++.

1. Verify that the yellow USB monitor LED (LED7, 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. Hold down the Control (CTRL) key.
3. Select the Start button on the Windows taskbar, then choose Programs-->Analog Devices-->VisualDSP++ 3.5 for 16-bit Processors-->VisualDSP++ Environment.If you are running VisualDSP++ for the first time, go to step 4.
   If you already have existing sessions, the Session List dialog box appears on the screen.

4. Click New Session.
5. The New Session dialog box, shown in Figure 1-12, appears on the screen.

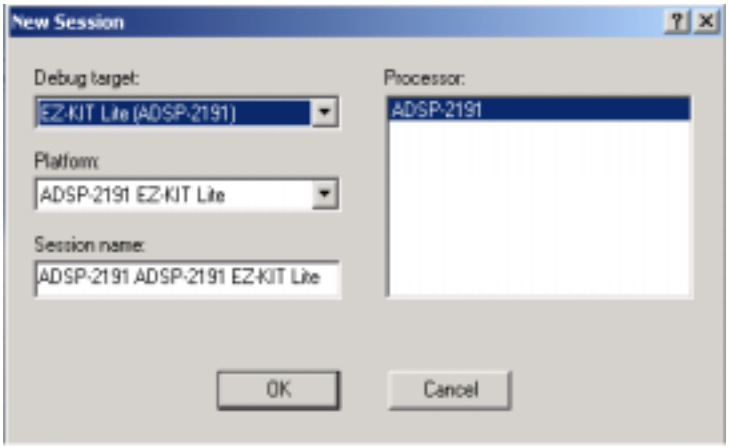

Figure 1-12. New Session Dialog Box

6. In Debug Target, choose EZ-KIT Lite (ADSP-2191).
7. In Processor, choose ADSP-2191.
8. Type a new target name in Session Name or accept the default name.
9. Click OK to return to the Session List. Highlight the new session and click Activate.

2 USING EZ-KIT LITE

This chapter provides specific information to assist you with developing programs for the ADSP-2191 EZ-KIT Lite evaluation board. This information appears in the following sections.

- "EZ-KIT Lite License Restrictions" on page 2-2

  Describes the restrictions of the VisualDSP++ license shipped with the EZ-KIT Lite.

- "Memory Map" on page 2-2

  Defines the ADSP-2191 EZ-KIT Lite's memory map.

- "Using Programmable Flag Pins" on page 2-3

  Describes the function and use of the programmable flag pins on the EZ-KIT Lite evaluation system.

- "Example Programs" on page 2-5

  Provides information about the example programs included in the ADSP-2191 EZ-KIT Lite evaluation system.

- "Using Flash Programmer Utility" on page 2-5

  Provides information on the Flash Programmer utility included with the EZ-KIT Lite software.

- "Restricted Software Breakpoints" on page 2-5

  Describes the software breakpoint restrictions.

For more detailed information about programming the ADSP-2191 processor, see "Related Documents" in the "Preface."

EZ-KIT Lite License Restrictions

The license shipped with the EZ-KIT Lite imposes the following restrictions.

- Program memory (PM) space is limited to 8K words (1/4 of the ADSP-2191 PM space).
- No connections to simulator or emulator sessions are allowed.

Memory Map

The ADSP-2191 processor has 32K words of internal SRAM that can be used for program storage or data storage. The configuration of internal SRAM is detailed in the *ADSP-219x/2191 DSP Hardware Reference*.

The ADSP-2191 EZ-KIT Lite board contains 512K x 8 bits of external Flash memory. This memory is connected to the processor's ~MS0 and ~BMS memory select pins. The Flash memory can be accessed in either the boot memory space or the external memory space.

Table 2-1. EZ-KIT Lite Evaluation Board Memory Map

Start Address		End Address	Page	Content
Internal Memory	0x00 0000	0x00 7FFF	0	24-Bit Program Memory (Internal)
	0x00 8000	0x00 FFFF	0	16-Bit Data Memory (Internal)

Table 2-1. EZ-KIT Lite Evaluation Board Memory Map (Cont'd)

Start Address		End Address	Page	Content
External Memory	0x01 0000	0x07 7FFF	1–7	External Memory (Bank 0)
	0x08 0000	0x0F FFFF	8–15	512K x 8 Flash Memory (Bank 0)
	0x10 0000	0x3F FFFF	16–63	External Memory (Bank 0)
	0x40 0000	0x7F FFFF	64–127	External Memory (Bank 1)
	0x80 0000	0xBF FFFF	128–191	External Memory (Bank 2)
	0xC0 0000	0xFE FFFF	192–254	External Memory (Bank 3)
Reserved	0xFF 0000	0xFF F3FF	255	24-Bit Boot ROM (Internal)
	0xFF F400	0xFF FFFF	255	RESERVED (Internal)
Boot Memory	0x01 0000	0x07 FFFF	1–7	Boot Memory
	0x08 0000	0x0F FFFF	8–15	512 x 8 Flash Memory
	0x10 0000	0xFE FFFF	1–254	Boot Memory
IO Memory	0x00 0000	0x00 1FFF	0–7	16-Bit Internal I/O Memory
	0x00 2000	0x03 FFFF	8–255	16-Bit External I/O Memory

Although the Flash memory starts at address 0x08 0000 in the Boot Memory Space, during EPROM boot the address 0x00 0000 is put on the address bus.

Using Programmable Flag Pins

The ADSP-2191 processor has eight asynchronous Programmable Flag (PF) IO pins (PF7-0) that let you interact with the running program. Data pins 8-15 can also be used as Programmable Flag pins, depending on the configuration of the DSP.

During reset, the flag pins (PF7-0) are used to set the multiplication factor, which sets the core clock frequency. After the DSP is reset, the flags are configured as inputs. The direction of the flags is configured though the DIR register and are set and read though the FLAGC/S register. For more information on configuring the flag pins, see the *ADSP-219x/2191 DSP Hardware Reference*. Flags and their uses are described in Table 2-2.

Table 2-2. Programmable Flag Pin Summary

Flag	Connected To	Description
PF0	LED8	PF3-0 are connected to the LEDs. They supply feedback for program execution. For instance, you can write your code to trigger a flag (and the corresponding LED) when a routine is complete.
PF1	LED9	
PF2	LED10	
PF3	LED11	
PF4	SW3 – Push button	PF5-4 are connected to the push buttons on the EZ-KIT Lite board and are for user input. For instance, you can tell your program to poll for a flag and when it occurs, do other operation, such as to jump to another instruction.
PF5	SW2 – Push button	
PF6	AD1803 Reset	PF6 is connected to the AD1803 telephony codec reset, and can be used to put the chip in reset.
PF7	AD1885 Reset	PF7 is connected to the AD1885 audio codec reset, and can be used to put the chip in reset.

All the programmable flags are available on connector P9.

Example Programs

Example programs are provided with the ADSP-2191 EZ-KIT Lite to demonstrate various capabilities of the evaluation board. These programs are installed with the EZ-KIT Lite software and can be found in:

```
\…\VisualDSP\219x\EZ-KITs\ADSP-2191\Examples
```

Please refer to the readme file provided with each example for more information.

Using Flash Programmer Utility

The ADSP-2191 EZ-KIT Lite evaluation system includes a Flash Programmer utility. The utility allows you to program the Flash memory on the EZ-KIT Lite. The Flash Programmer is installed with VisualDSP++. Once the utility is installed, it is accessible from the Tools pull-down menu.

For more information on the Flash Programmer utility, select Start and choose Programs-->VisualDSP-->VisualDSP++ Documentation.

Restricted Software Breakpoints

Under some conditions, breakpoints cannot effectively be placed.

Generally, the emulator or EZ-KIT Lite development system restricts breakpoint placement when certain conditions are met. These conditions depend on things such as bus architecture, pipeline depth, and ordering.

Software Breakpoints Within Delayed Slots

Software breakpoints within a delayed slot, such as within two instructions of a delayed branch, are restricted.

In the following example, placing a breakpoint at 100 is acceptable. However, a breakpoint's behavior at 101 or 102 is not defined and, therefore, is restricted.

```
100 IF EQ JUMP 0x0000     /* .+0  */ (DB);
101 NOP;
102 NOP;
```

Additionally, breakpoints within two instructions of an IO access are restricted. In the following example, a breakpoint at 100 is acceptable, but a breakpoint at 101 or 102 is restricted.

```
100 DM(0x8000)=IO;    /* or IO=DM(0x8000); */
101 NOP;
102 NOP;
```

3 EZ-KIT LITE HARDWARE REFERENCE

This chapter describes the hardware design of the ADSP-2191 EZ-KIT Lite board. The following topics are covered.

- "System Architecture" on page 3-2

  Describes the configuration of the ADSP-2191 EZ-KIT Lite board and explains how the board components interface with the processor.

- "Jumper and DIP Switch Settings" on page 3-6

  Shows the location and describes the function of the configuration jumpers and the clock multiplication factor selection switch.

- "LEDs and Push Buttons" on page 3-11

  Shows the location and describes the function of the LEDs and push buttons.

- "Connectors" on page 3-14

  Shows the location and gives the part number for all the connectors on the board. Also, the manufacturer and part number information is given for the mating parts.

- "Specifications" on page 3-18

  Gives the requirements for powering the board as well as the mechanical locations of some components of the board.

System Architecture

This section describes the processor's configuration on the EZ-KIT Lite board.

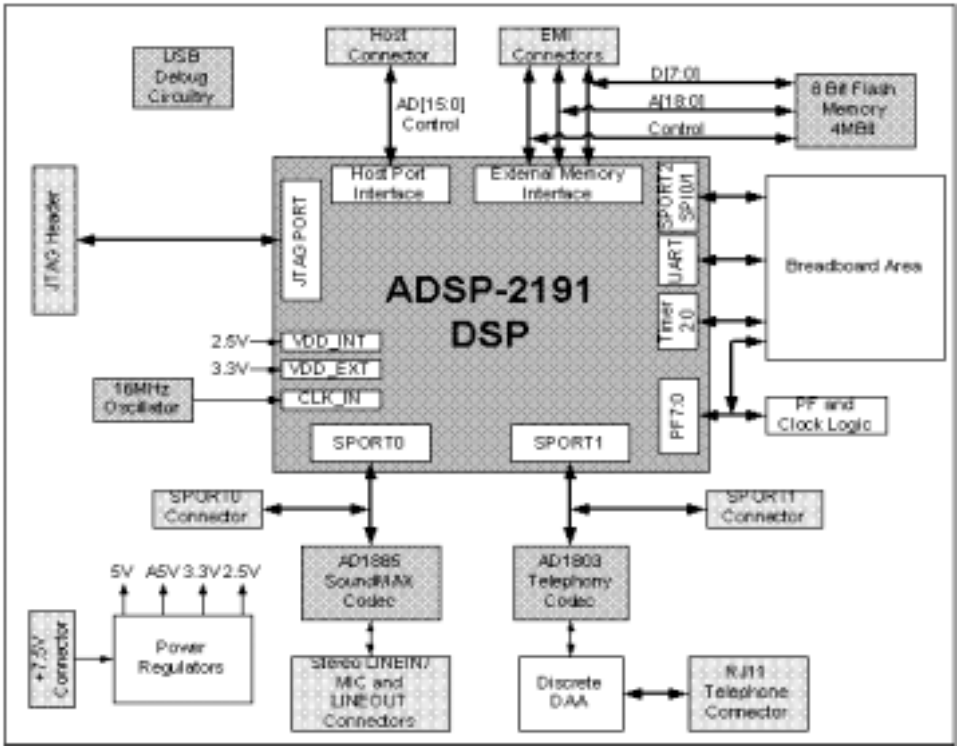

Figure 3-1. System Architecture

The EZ-KIT Lite has been designed to provide access to all the capabilities of the ADSP-2191 processor. The EZ-KIT Lite board can be configured to boot in all of the possible ADSP-2191 boot modes. For information about configuring the boot mode, see "Boot Mode Select Switch (JP6)" on page 3-9.

The processor core voltage is 2.5V, and the external interface operates at 3.3V. The input clock to the DSP is a 16-MHz through-hole oscillator. Footprints are provided on the board for a surface-mount oscillator or a through-hole crystal. The speed at which the core operates is determined by the configuration of the multiplication factor switch (SW4) at reset and the state of the BYPASS jumper (JP7). (See "Bypass Mode Select Switch (JP7)" on page 3-9 and "DSP Clock Multiplier Select Switch (SW4)" on page 3-10.) By default, the processor core runs at 160 MHz.

External Memory Interface (EMI)

The External Memory Interface (EMI) is connected to a 512K x 8-bit Flash memory. This memory is connected to the boot memory select (~BMS) pin and the memory select 0 (~MS0) pin, allowing the Flash memory to be used to boot the processor as well as store information during normal operation. Refer to "Memory Map" on page 2-2 for information about the location of the Flash memory in the processor's memory map.

All of the address, data, and control signals are available externally via two off-board connectors. The pinout of the EMI connectors (P10, P11) is shown in "Schematics" on page B-1.

The upper 8-bits of the data bus (D15-D8) can also be used as programmable flag pins.

Host Port Interface (HPI)

The Host Port Interface (HPI) signals are brought to an unpopulated off board connector P12. This allows the HPI to interface to a user application. The pinout of the host port connector (P12) is shown in "Schematics" on page B-1.

SPORT0 – Audio Interface

SPORT0 is connected to the AD1885 SoundMAX codec (U10). Two 3.5mm stereo jacks (P3, P4) allow audio to be input and output. You can supply an audio input to the Codec Microphone Input Channel (MIC1) or to the stereo LINE_IN input channel. The jumper settings of JP1 determine the codec channel driven by the input jack (P3). The PF6 programmable flag, which is connected to the reset pin of the AD1885 codec, allows the processor to reset the codec.

SPORT0 is also routed to an off-board connector (P6). When you use the off-board connector, the codec must be disabled to avoid bus contention. JP3 disables the codec by putting it into reset and disabling the codec outputs from driving the processor's SPORT inputs. For more information about disabling the codec, see "Telephony Codec Disable (JP3)" on page 3-8.

SPORT1 Telephony Interface

SPORT1 is connected to the AD1803 telephony codec (U11). The telephony interface provided by the AD1803 allows the processor to act as a modem on a standard telephone line. Four of the general-purpose pins of the AD1803 codec are used. The following table gives the function of each of the general-purpose pins.

Table 3-1. AD1803 General-Purpose Pin Function

AD1803 Pin	Description
G[0]	Used to connect or disconnect from the telephone line
G[1]	Detects when the phone is ringing
G[4]	Used as a speaker output, to monitor the telephone communication
G[5]	Connected to an LED. This LED can be used for any application; for example, to indicate an incoming call or a phone in use

SPORT1 is also routed to an off-board connector (P7). When you use the off-board connector, the codec must be disabled to avoid bus contention. JP4 disables the codec by putting it into reset and disabling the codec outputs from driving the processor's SPORT inputs. For more information about disabling the codec, see "Audio Codec Disable Jumper (JP4)" on page 3-8.

Breadboard Area

Use the breadboard area to add external circuitry. You can connect the following processor interfaces to the breadboard area.

- Programmable flags (PF0-PF7)
- SPORT2/SPI0/SPI1
- UART
- Timers
- All board voltages and grounds
- Package Footprints
    - 1x SOIC16
    - 1x SOIC20
    - 4x SOT23-6
    - 1x PSOP44
    - 2x SOT23
    - 27x 0805

Any circuitry added to the breadboard area is not supported.

JTAG Emulation Port

The JTAG emulation port allows an emulator to access the processor's internal and external memory, as well as the special function registers.

See "JTAG (P8)" on page 3-16 for more information about the JTAG connector. To learn more about available emulators, contact Analog Devices (see "Product Information" in the "Preface").

Jumper and DIP Switch Settings

This section describes the function of all the jumpers and DIP switches. The following figure shows the location of all the jumpers and DIP switches.

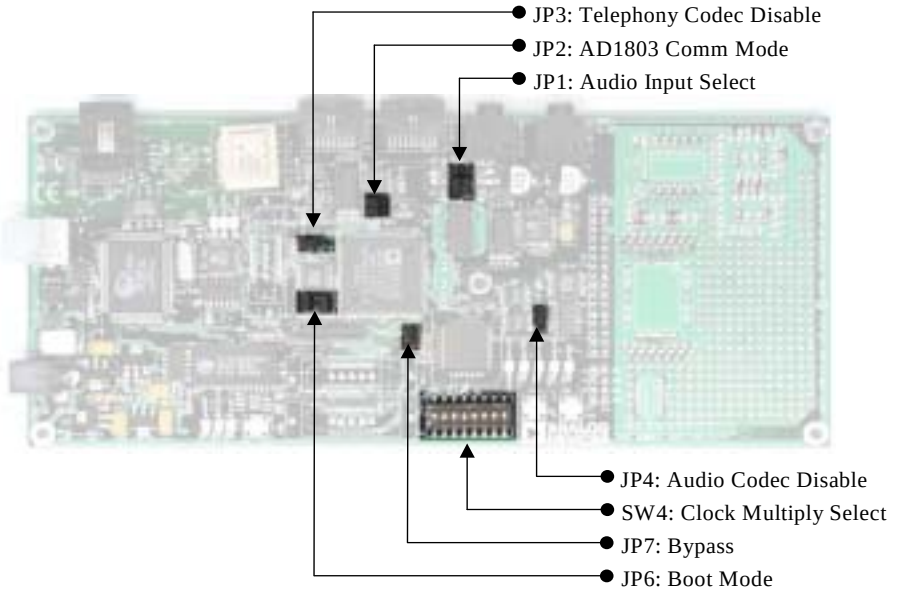

Figure 3-2. Jumper and Switch Locations

Audio Input Select Jumper (JP1)

The audio input jack (P3) can be connected to the MIC1 or the LINEIN input channels of the AD1885 codec. When the JP1 jumpers connect pins 1 and 3 and pins 2 and 4, P3 connects to the mono MIC1 channel.

When the jumpers connect pins 3 and 5 and pins 4 and 6, P3 connects to the stereo LINE_IN channel of the AD1885 codec. These jumper settings are shown in Figure 3-3. (The words MIC and LINE are on the board as a reference.)

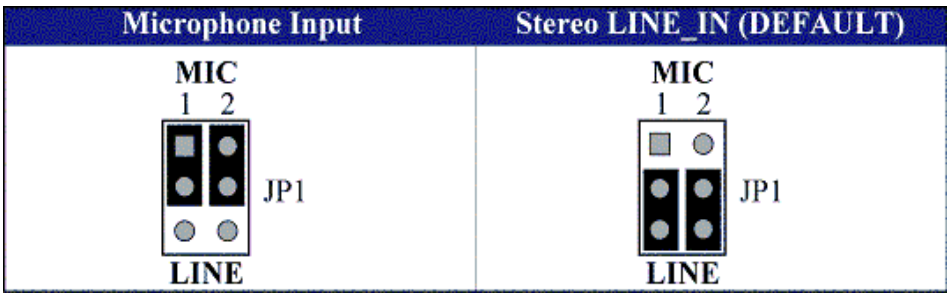

Figure 3-3. Audio Input Jumper Settings (JP1)

Telephony Codec Serial Interface Mode (JP2)

The AD1803 is capable of AC'97 communication or standard processor serial port communication. The Serial Interface Mode jumpers determine the type

of serial interface that the AD1803 emulates. The following table shows the jumper setting for each mode.

Table 3-2. Jumper Settings for Serial Interface Mode

Pins 1 & 2	Pins 3 & 4	Mode
Not Installed	Not Installed	AC'97 Primary (ID:00) (Default)
Not Installed	Installed	AC'97 Secondary (ID:10)
Installed	Not Installed	AC'97 Secondary (ID:01)
Installed	Installed	DSP Mode

Telephony Codec Disable (JP3)

Placing a jumper between pins 2 and 3 of JP3 places the AD1803 into reset and isolates its serial port outputs, which are connected to the processor. When a jumper is between pins 1 and 2 of JP3, the AD1803 is reset on power-up or it can be reset with PF6 of the processor. These positions are labeled on the board as DIS and ENA 1803.

Audio Codec Disable Jumper (JP4)

Placing a jumper between pins 2 and 3 of JP4 places the AD1885 in reset and isolates its serial port outputs, which are connected to the processor. When a jumper is between pins 1 and 2 of JP4, the AD1885 is reset on power-up or it can be reset with PF7 of the processor. These positions are labeled on the board as DIS and ENA 1885.

Boot Mode Select Switch (JP6)

The boot mode select switch determines how the processor boots. Table 3-3 shows the jumper settings for the boot modes.

Table 3-3. Boot Mode Select Jumper (JP6) Settings

OPMODE Pins 1 and 2	BMODE1 Pins 3 and 4	BMODE0 Pins 5 and 6	Function
Installed	Installed	Installed	Execute from 16-bit external memory (no boot).
Installed	Installed	Not Installed	Boot from EPROM
Installed	Not Installed	Installed	Boot from Host (Default)
Installed	Not Installed	Not Installed	Reserved
Not Installed	Installed	Installed	Executed from 8-bit external memory (no boot)
Not Installed	Installed	Not Installed	Boot from UART
Not Installed	Not Installed	Installed	Boot from SPI, up to 4K bits
Not Installed	Not Installed	Not Installed	Boot from SPI, >4K bits, up to 512K bits

Bypass Mode Select Switch (JP7)

When the bypass mode jumper is not installed, the processor's core clock and the input clock (CLKIN) run at the same speed. The evaluation board ships with a 16-MHz oscillator. When JP7 is removed, the core runs at 16 MHz.

When you use VisualDSP++ to debug the processor, the core clock must run at a minimum of 24 MHz. The processor cannot be debugged in bypass mode.

When the jumper is installed, the configuration of SW4 at reset determines the core clock speed.

DSP Clock Multiplier Select Switch (SW4)

The core clock speed of the processor after reset is set by the position of the DSP Clock Multiplier Select Switch (SW4) settings at reset.

Table 3-4 shows the default setting for SW4. This setting will produce a 10x-multiplication factor, which results in a 160-MHz core clock speed. For more information about setting up the multiplication factors, refer to the "Managing DSP Clocks" section of the *ADSP-219x/2191 DSP Hardware Reference*.

Table 3-4. DSP Clock Multiplier Select Switch (SW4) Default Settings

Pin Name	MSEL0	MSEL0	MSEL0	MSEL0	MSEL0	MSEL0	MSEL0	DF
Switch Location	1	2	3	4	5	6	7	8
Switch Setting	On	Off	On	Off	On	On	On	On

LEDs and Push Buttons

This section describes the functionality of the LEDs and push buttons. Figure 3-4 shows the locations of the LEDs and push buttons.

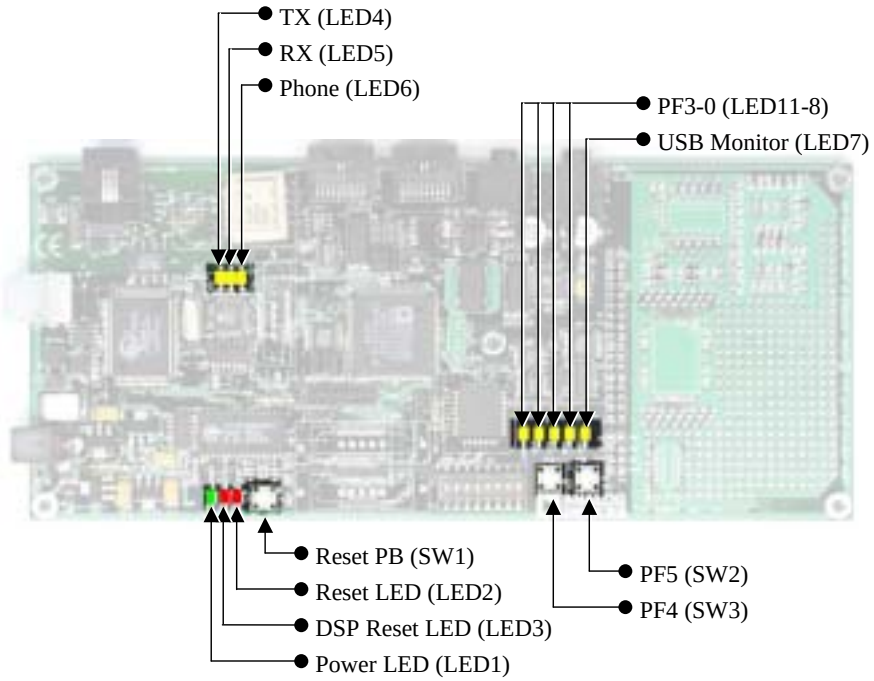

Figure 3-4. LED and Push Button Locations

Power LED (LED1)

When LED1 is lit (green), power is being properly supplied to the board.

Reset LEDs (LED2, LED3)

When LED2 is lit, the master reset for all the major ICs is active. Therefore, the ADSP-2191 processor (U1), CY7C64603 (U3), AD1885 (U10), and AD1803 (U11) are being reset.

When LED3 is lit, the ADSP-2191 (U1) is being reset. The USB interface resets the ADSP-2191 during USB communication initialization.

Telephony LEDs (LED6–4)

Three LEDs connect to the AD1803 telephony codec. LED4 indicates that the AD1803 is transmitting serial data to the processor's SPORT1. LED5 indicates that the AD1803 is receiving serial data from the processor. LED6 is a user programmable flag connected to G[5], one of the general-purpose pins of the AD1803 codec. For more information about the AD1803, refer to "SPORT1 Telephony Interface" on page 3-4.

USB Monitor LED (LED7)

The USB Monitor LED (LED7) indicates that USB communication has been initialized successfully and you can connect to the processor by using a VisualDSP++ EZ-KIT Lite session. If the LED does not light, try resetting the board, reinstalling the USB driver (see "Installing EZ-KIT Lite USB Driver" on page 1-7), or both.

Programmable Flag LEDs (LED10–8)

Four LEDs are connected to four of the processor's Programmable Flag (PF) pins, PF3-0. These LEDs are active HIGH and are lit by an output of "1" from the processor. Refer to "Using Programmable Flag Pins" on page 2-3 for more information on how the flags can be used to program the processor.

Table 3-5. Programmable Flag LEDs

LED Reference Designator	DSP Programmable Flag Pin
LED8	PF0
LED9	PF1
LED10	PF2
LED11	PF3

Reset Push Button (SW1)

The RESET push button resets the ADSP-2191 (U1), CY7C64603 (U3), AD1885 (U10), and AD1803 (U11). During reset, the USB interface is automatically reinitialized.

Pressing the RESET push button (SW1) while VisualDSP++ is running disrupts communication and causes errors in the current debug session. You must close and re-open VisualDSP++.

Programmable Flag Push Buttons (SW2 and SW3)

Two push buttons are provided for general-purpose user input. SW2 and SW3 connect to the processor's programmable flag pins. The push buttons are active high and when pressed, send a high (1) to the processor. Refer to "Using Programmable Flag Pins" on page 2-3 for more information on how the flags can be used to program the processor.

Table 3-6. Programmable Flag Push Buttons

Flag Pin	Push Button Reference Designator
PF4	SW3
PF5	SW2

Connectors

This section describes the connector functionality and provides information about mating connectors. The locations of the connectors are shown in Figure 3-5.

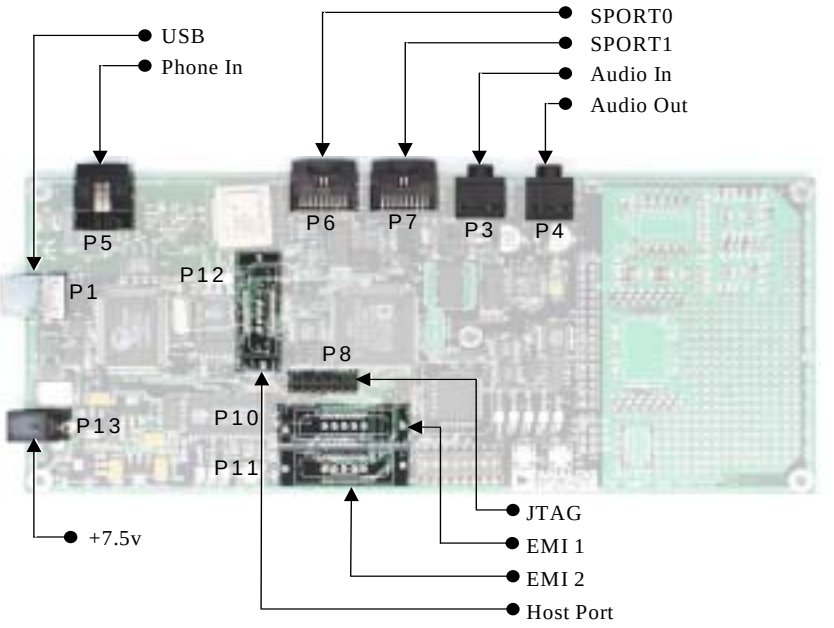

Figure 3-5. Connector Locations

USB (P1)

The USB connector is a standard Type B USB receptacle. This connector is used to debug the processor and is not connected to the processor's USB interface.

Part Description	Manufacturer	Part Number
Type B USB receptacle (P1)	Mill-Max	897-30-004-90-000
	Digi-Key	ED90003-ND
Mating Connector		
USB cable (provided with kit)	Assmann	AK672-5
	Digi-Key	AK672-5ND

Audio (P3, P4)

These connectors are two 3.5 mm stereo audio jacks: one input and one output.

Part Description	Manufacturer	Part Number
3.5 mm stereo jack (P3, P4)	Shogyo	SJ-0359AM-5
Mating Cable		
3.5 mm stereo plug to 3.5 mm stereo cable	Mouser	172-3504

Telephone (P5)

The telephone connector is a standard 6-position 4-contact phone jack.

Part Description	Manufacturer	Part Number
Phone jack (P5)	AMP	555165-2

SPORT0 (P6) and SPORT1 (P7)

SPORT0 and SPORT1 are each connected to a 20-pin connector.

Table 3-7. SPORT Connectors

Part Description	Manufacturer	Part Number
20 position AMPMODU system 50 receptacle	AMP	104069-1
Mating Connectors		
20 position AMPMODU system 20 connector	AMP	2-487937-0
20 position AMPMODU system 20 connector (without lock)	AMP	2-487938-0
Flexible film contacts (20 per connector)	AMP	487547-1
Mating Assembly		
Straight-through assembly with locking connector on each end	Gopher Electronics	DRFFC10X7RHU-RHU5

JTAG (P8)

The JTAG header is the connecting point for a JTAG in-circuit emulator pod. When an emulator is connected 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.

External Memory Interface (P10, P11)

Two MICTOR board-to-board connectors provide all of the processor's External Memory Interface signals. Contact AMP for information about mating connectors. The location of these connectors is shown in "Mechanical Dimensions" on page 3-20.

Table 3-8. External Memory Connectors

Part Description	Manufacturer	Part Number
38-Position MICTOR	AMP	2-767004-2

Host Port Interface (P12)

One MICTOR board-to-board connector provides all the processor's Host Port Interface signals. Contact AMP for information about mating connectors. The location of this connector is shown in "Mechanical Dimensions" on page 3-20.

Table 3-9. Host Port Connector

Part Description	Manufacturer	Part Number
38-Position MICTOR	AMP	2-767004-2

Power Connector (P13)

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

Part Description	Manufacturer	Part Number
2.5 mm Power Jack	Switchcraft	RAPC712
	Digi-key	SC1152-ND

Part Description	Manufacturer	Part Number
Mating Power Supply (shipped with EZ-KIT Lite)		
7.5V Power Supply	GlobTek	TR9CC2000LCP-Y

Specifications

This section provides the requirements for powering the board and the mechanical locations of board components.

Power Supply

The power connector supplies DC power to the EZ-KIT Lite board. Table 3-10 shows the power connector pinout.

Table 3-10. Power Connector

Terminal	Connection
Center pin	+7.5 VDC@2amps
Outer Ring	GND

Table 3-11 shows the power supply specifications.

Table 3-11. Power Supply Specifications

Input	Output	General
Voltage: 90–264 V AC	Voltage: 7.5 V DC + 5%	Operating Temp: 0 to +40 C
Frequency: 47–63 Hz	Current: 2 A	Storage Temp: -20 to +85 C
Current: < 0.5 A	Regulation: < 5%	Efficiency: 65% typical
Inrush Current: < 40 A	Total Power: 15 W Max	Approvals: UL, CUL, CE
Protection: 1 A fuse	Noise and ripple: < 1%	EMC: EN55022 Class B

Table 3-11. Power Supply Specifications (Cont'd)

Input	Output	General
Connector: IEC320 / C14 /3 Pin	Protection: Short Ckt, Over Load, Over Volt	
	Connector: FB, 5.5 x 2.5 x 11 mm, CP	

Board Current Measurements

The ADSP-2191 EZ-KIT Lite board provides six zero-ohm resistors, which you can remove to measure current draw. Table 3-12 shows the resistor number, the voltage plane, and a description of each component on the plane.

Table 3-12. Current Measurement Resistors

Resistor	Voltage Plane	Description
R89	5V	Main power of the entire board except A5V
R85	A5V	5V analog side of the AD1885
R90	3.3V	All 3.3V ICs, Pull-up Resistors, and LEDs
R87	VDDINT	Core Voltage of the processor
R88	VDDEXT	IO Voltage of the processor

Mechanical Dimensions

Figure 3-6 shows the dimensions of the board and the location MICTOR connectors (P10, P11, P12).

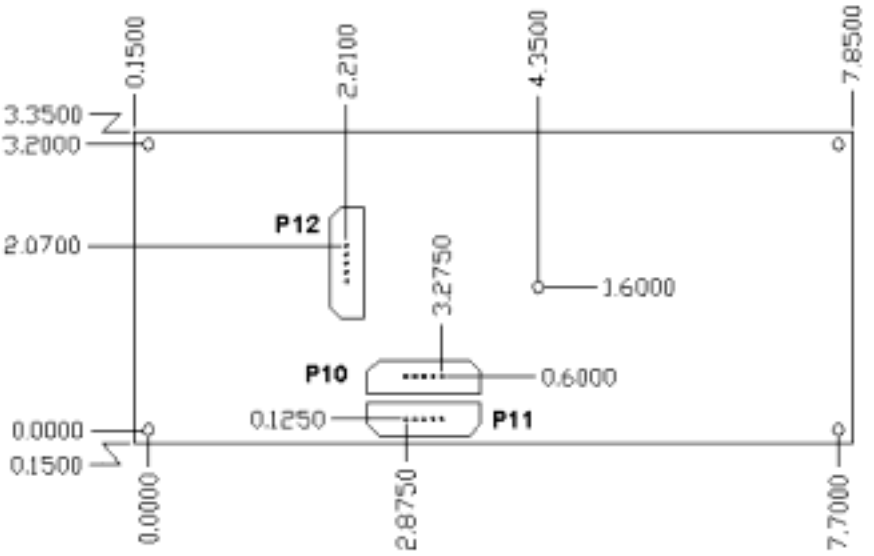

Figure 3-6. Mechanical Dimensions

A BILL OF MATERIALS

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
1	3	0.00 1/4W 5% RC05	R87-89	YAGEO	0.0QBK-ND
2	1	M29W040 PLCC32 FLASH-512K-X-8-3V	U7	ST MICRO	M29W040B120K6
3	1	74LVC14A SOIC14 HEX-INVER-SCHMITT-TRIG-GER	U6	TI	74LVC14AD
4	2	IDT74FCT3244APY SSOP20 3.3V-OCTAL-BUFFER	U2, U16	IDT	IDT74FCT3244APY
5	1	24.576MHZ SMT OSC005 CRYSTAL	Y4	EPSON	MA505 24.576M-C2
6	1	CY7C64603-128 PQFP128 USB-TX/RX MICROCON-TROLLER	U3	CYPRESS	CY7C64603-128NC
7	1	MMBT4401 SOT-23 NPN TRANSISTOR 200MA	Q1	FAIRCHILD	MMBT4401
8	2	74LVC00AD SOIC14	U5, U8	PHILIPS	74LVC00AD
9	1	24LC00-SN SOIC8 128 BIT SERIAL EEPROM	U4	MICROCHIP	24LC00-SN
10	1	82082R ICS004 1:1 TRANSFORMER	T1	MIDCOM	82082R
11	1	TS117P ICS003 TELECOM SWITCH	U14	CP CLARE	TS117P

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
12	1	CY7C1019BV33-15VC SOJ32 128K X 8 SRAM	U12	CYPRESS	CY7C1019BV33-12VC
13	2	AD8532AR SOIC8 DUAL AMP 250MA	U12-U13	ANALOG DEVICES	AD8532AR
14	1	BC517 TO-92 DARLINGTON TRAN	Q2	ON SEMI-CONDUCTR	BC517
15	1	16MHZ OSC001	U19	DIGI-KEY	SG-8002DC-PCC-ND (16MHZ)
16	1	SN74AHC1G02 SOT23-5 SINGLE-2 INPUT-NOR	U25	TI	SN74AHC1G02DBVR
17	1	SN74LV164A SOIC14 8-BIT-PARALLEL-SERIAL	U22	T1	SN74LV164AD
18	1	CY7C4201V-15AC TQFP32 64-BYTE-FIFO	U21	CYPRESS	CY7C4201V-15AC
19	1	12.0MHZ THR OSC006 CRYSTAL	Y2	DIG01	300-6027-ND
20	1	10 1/4W 5% RC05	R50	YAGEO	10QTR-ND
21	3	1000pF 50V 5% 1206 CERM	C26, C36-37	AVX	12065A102JAT2A
22	2	0.1uF 50V 10% 1206 CERM	C11-12	PHILIPS	12062R104K9BB2
23	1	22uF 25V 10% D TANT	CT12	SIEMENS	B45196-H5226-K409
24	1	AD1803JRU TSSOP24	U11	ANALOG DEVICES	AD1803JRU
25	1	ADM708SAR SOIC8 VOLTAGE-SUPERVISOR	U15	ANALOG DEVICES	ADM708SAR
26	1	AD1885JST LQFP48 AC97 STEREO CODEC	U10	ANALOG DEVICES	AD1885JST

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
27	1	ADP3338AKC-33 SOT-223 3.3V-1.0AMP REGULATOR	VR3	ANALOG DEVICES	ADP3338AKC-3.3
28	1	ADP3338AKC-5 SOT-223 5.0V-1.0AMP REGULATOR	VR2	ANALOG DEVICES	ADP3338AKC-5
29	1	ADP3338AKC-25 SOT-223 2.5V-1.0AMP REGULATOR	VR4	ANALOG DEVICES	ADP3338AKC-2.5
30	1	ADP3339AKC-5 SOT-223 5V-1.5A REGULATOR	VR1	ANALOG DEVICES	ADP3339AKC-5-REEL
31	1	ADSP-2191MKST160 LQFP144 1.3MBIT-FIXED-150MHZ	U1	ANALOG DEVICES	ADSP2191-22MKST160
32	1	RJ11 4PIN CON002 RIGHT ANGLE	P5	AMP	555165-1
33	1	PWR 2.5MM_JACK CON005 RA	P13	SWITCH-CRAFT	SC1152-ND12
34	1	USB 4PIN CON009 USB	P1	MILL-MAX	897-30-004-90-000000
35	2	.05 10X2 CON014 RA	P6-7	AMP	104069-1
36	1	DIP8 SWT012	SW4	DIGI-KEY	CKN3060-ND
37	3	SPST-MOMENTARY SWT013 6MM	SW1-3	PANASONIC	EVQ-PAD04M
38	6	0.00 1/8W 5% 1206	R28-29,R85,R90,R99,R111	YAGEO	0.0ECT-ND
39	2	220uF 10V 20% E ELEC	CT2-3	SPRAGUE	293D227X9010E2T
40	8	AMBER-SMT LED001 GULL-WING	LED4-11	PANASONIC	LN1461C-TR
41	2	0.22uF 25V 10% 805 CERM	C114	AVX	08053C224FAT

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
42	29	0.01uF 100V 10% 805 CERM	C49-69, C75-82	AVX	08051C103KAT2A
43	1	0.22uF 25V 10% 805 CERM	C89	AVX	08053C224FAT
44	27	0.1uF 50V 10% 805 CERM	C21, C23-24, C33-C35, C38-48, C70-74, C83-84, C86-88	AVX	08055C104KAT
45	5	10uF 16V 10% C TANT	CT13-17	SPRAGUE	293D106X9025C2T
46	42	10K 100MW 5% 805	R8,R11, R13-16,R31-32,R45, R53-54,R59, R68,R70-81,R92-98, R100-102, R104-107, R110,R114-115	AVX	CR21-103J-T
47	3	33 100MW 5% 805	R1, R30, R113	AVX	CR21-330JTR
48	4	4.7K 100MW 5% 805	R52, R82-84	AVX	CR21-4701F-T
49	1	1M 100MW 5% 805	R5	AVX	CR21-1004F-T
50	1	1.5K 100MW 5% 805	R9	AVX	CR21-1501F-T
51	3	2.21K 1/8W 1% 1206	R6-7, R27	AVX	CR32-2211F-T
52	1	10pF 100V 10% 1206 CERM	C17	AVX	12061A100JATMA

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
53	1	2.2uF 35V 10% B TANT	CT11	AVX	TAJB225K035R
54	3	10uF 16V 10% B TANT	CT6, CT18-19	AVX	TAJB106K016R
55	3	100 100MW 5% 805	R49, R57-58	AVX	CR21-101J-T
56	1	1000 100MHZ 1.5A FER002 0.06 CHOKE	FER10	MURATA	PLM250S40T1
57	2	2A S2A_RECT DO-214AA SILICON RECTIFIER	D10-11	GENER-ALSEMI	S2A
58	7	600 100MHZ 500MA 1206 0.70 BEAD	FER1-5, FER8, FER11	DIGIKEY	240-1019-1-ND
59	1	0.047UF 16V 10% 1206	C10	AVX	12065C473JATME
60	2	270PF 50V 10% 805	C6, C9	KEMET	C1206C271J5GAC210
61	4	1UF 16V 10% 805 X7R	C90-93	MURATA	GRM40X7R105K016AL
62	4	470PF 100V 10% 1206 CERM	C4-5, C7-8	AVX	12061A471JAT2A
63	2	30PF 100V 5% 1206	C3, C85	AVX	12061A300JAT2A
64	1	100A P3100SB DO-214AA SIDACTOR 275V	D8	TECCOR	P3100SB
65	2	95 100MHZ FER003 0.9	FER6-7	FAIR-RITE	2743021447
66	2	27.4K 1/10W 1% 805	R35, R39	DALE	CRCW0805-2742FT
67	1	560 1/10W 1% 805	R91	DALE	CRCW0805-5600FT
68	1	249K 1/10W 1% 805	R36	DALE	CRCW0805-2493FRT1
69	2	97.6K 1/10W 1% 805	R37-38	DALE	CRCW0805-9762FT
70	1	124K 1/10W 1% 805	R40	DALE	CRCW0805-1243FT

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
71	2	8.2K 1/10W 1% 805	R42-43	DALE	CRCW0805-8201FT
72	1	18.2 1/8W 1% 1206	R44	DALE	CRCW1206-100-18R2FT
73	1	7.5K 1/10W 5% 805	R46	DALE	CRCW0805-752JT
74	1	47K 1/10W 1% 805	R47	DALE	CRCW0805-4702FT
75	1	24.3K 1/10W 1% 805	R48	DALE	CRCW0805-2432FRT1
76	1	200MA 1N5235B DO-35	D9	ON SEMI-CONDUCTR	1N5235B
77	2	225MA CMPD2004S SOT23D	D3-4	CENTRAL SEMICON	CMPD2004S
78	2	1.5A BZX84C18LT1 SOT23D ZENER 18V	D6-7	ON SEMI-CONDUCTR	BZX84C18LT1
79	2	6A BZX84C4V3 SOT23D ZENER 4.3V	D1-2	DIODES	BZX84C4V3-7
80	1	0.47UF 250V 10% 2220 MONOLITHIC	C32	MURATA	GHM1545B474K250
81	1	82PF 50V 5% 805 NPO	C27	AVX	08055A820JAT2A
82	2	680PF 50V 1% 805 NPO	C22, C25	AVX	08055A681FAT2A
83	2	1000PF 2KV 105 1812 CERM	C28, C31	MURATA	GRM43-2X7R102K1KVAL
84	1	0.047UF 250V 20% 1206 MONOLITHIC	C29	MURATA	GHM1530B473K250
85	1	10UF 25V +80-20% 1210 Y5V	C30	MURATA	GRM235Y.5V106Z025
86	1	0.00 100MW 5% 805	C14	PAN	ERJ-6GE10R00V
87	1	10K 100MW 2% RNET16 BUSSED	RN1	CTS	767-161-103G
88	2	1K 1/8W 5% 1206	R10, R41	AVX	CR32-102J-T

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
89	6	10K 1/8W 5% 1206	R20-25	DALE	CRCW1206-1002FRT1
90	1	100K 1/8W 5% 1206	R86		CR1206-1003FTR1
91	1	20.0K 1/8W 1% 1206	R103		
92	2	22 1/8W 5% 1206	R3-4		
93	11	270 1/8W 5% 1206	R51, R55-56, R60-64, R66-67, R69	AVX	CR32-271J-T
94	4	4.7K 1/8W 5% 1206	R17-19, R26	AVX	CR32-472J-T
95	1	680 1/8W 5% 1206	R65	AVX	CR32-681J-T
96	2	RED-SMT LED001 GULL-WING	LED2-3	PANASONIC	LN1261C
97	1	GREEN-SMT LED001 GULL-WING	R65	PANASONIC	ECS-T1EY105R
98	4	1uF 25V 20% A TANT -55+125	CT9-10, CT20-21	AVX	CR32-681J-T
99	4	QS3257Q QSOP16 QUICKSWITCH-257	U17-18, U23-24	ANALOG DEVICES	ADG774ABRQ
100	1	IDC 2X1 IDC2X1 2X1 TIN	JP7	BERG	54101-T08-02
101	2	IDC 3X1 IDC3X1	JP3-4	BERG	54101-T08-03
102	1	IDC 2X2 IDC2X2 0.1x0.1	JP2	BERG	54102-T08-02
103	2	IDC 3X2 IDC3X2	JP1, JP6	BERG	54102-T08-03
104	1	IDC 7X2 IDC7X2	P8	BERG	54102-T08-07
105	10	IDC 2PIN_JUMPER 0.1	SJ1-10	MOLEX	15-38-1024

Reference	Quantity	Description	Reference Design	Manufacturer	Part Number
106	1	2.5A RESETABLE FUS001	F1	RAYCHEM CORP.	SMD250-2
107	2	3.5MM STEREO_JACK CON001	P3-4	Shogyo	SJ-0359AM-5

ADSP-2191 EZ-KIT LITE

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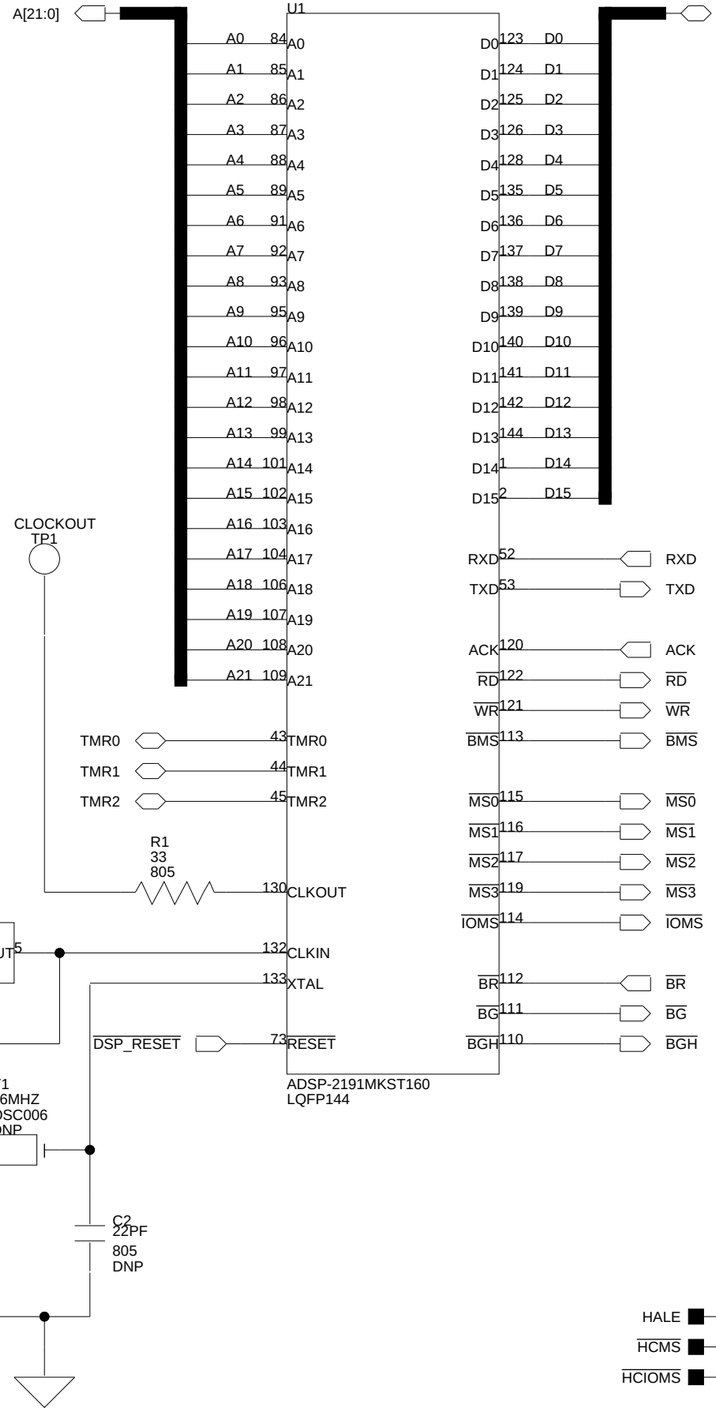
Title		
ADSP-2191 EZ-KIT LITE - TITLE		
Size: B	Board No.: A0158-2000	Rev: 2.2
Date: 7-15-2002 9:54	Sheet: 1 OF 14	



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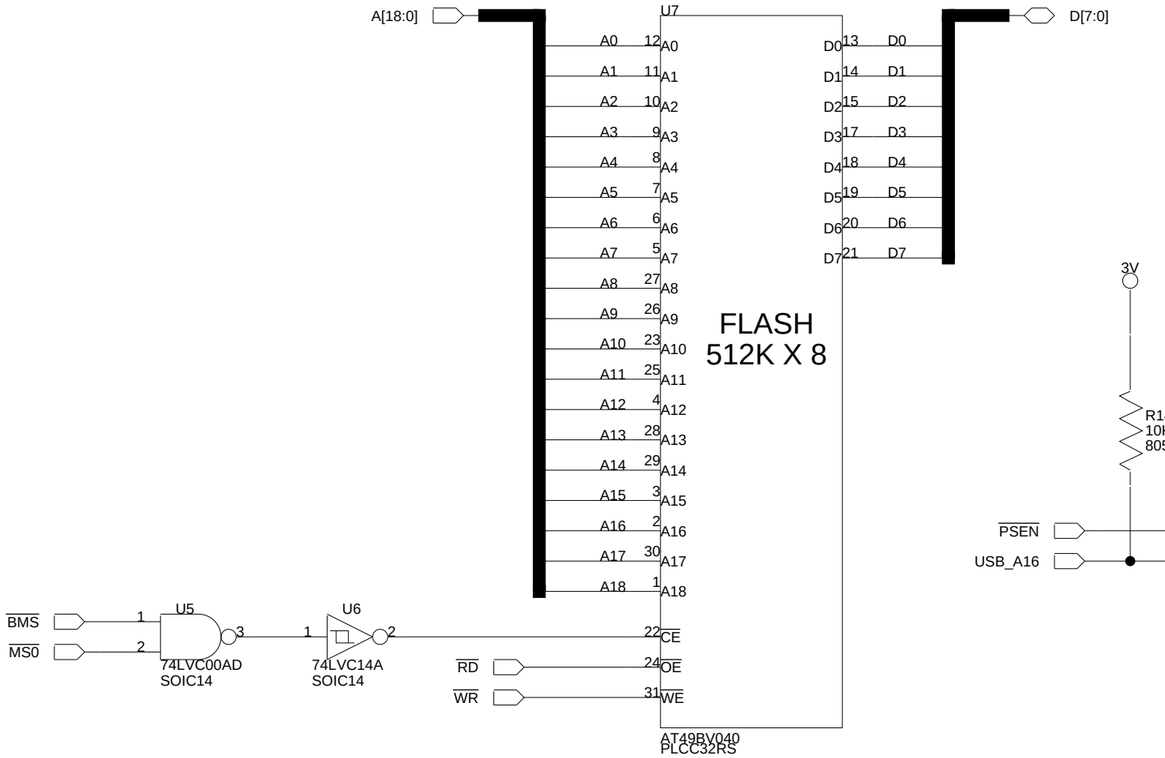
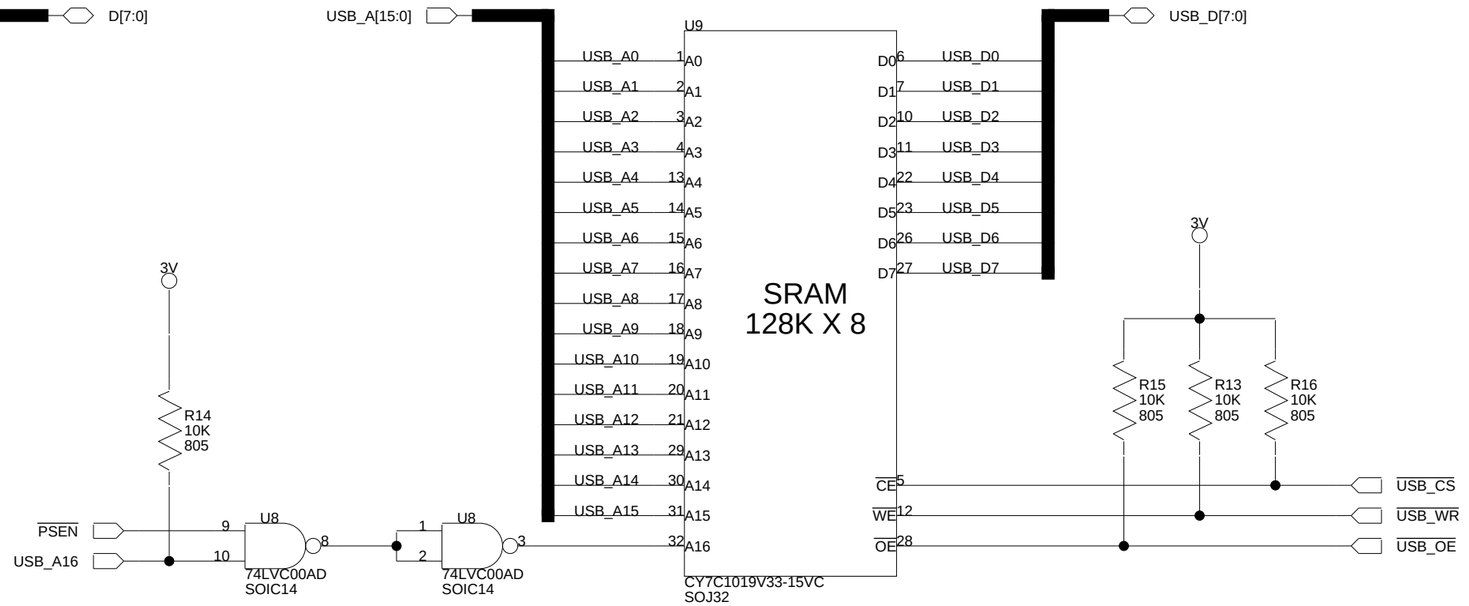
Title: ADSP-2191 EZ-KIT LITE - DSP

Size: B | Board No.: A0158-2000 | Rev: 2.2

Date: 7-15-2002_9:54 | Sheet: 2 OF 14





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Title: ADSP-2191 EZ-KIT LITE - FLASH/SRAM

Size	Board No.	Rev
B	A0158-2000	2.2

Date 7-15-2002_9:54 | Sheet 3 OF 14

JP1 SETTINGS		
SJ1	SJ2	INPUT SOURCE
1 & 3	2 & 4	MIC IN
* 3 & 5	4 & 6	LINE IN

* = DEFAULT

SJ2 SHORTING JUMPER DEFAULT=3 & 5

SJ1 SHORTING JUMPER DEFAULT=4 & 6

POPULATE TO COMPLY WITH PC99

R27 2.21K 1206

R28 0.00 1206 ALT_VAL=1K

C89 0.22UF 805

C13 0.01UF 1206 DNP

JP1 IDC3X2

AGND

FER3 600 1206

C4 470PF 1206

R17 4.7K 1206

C90 1UF 805

R26 4.7K 1206

LINE IN/MIC

P3 CON001

FER2 600 1206

C5 470PF 1206

R18 4.7K 1206

C91 1UF 805

R19 4.7K 1206

HEAD PHONE OUT

P4 CON001

FER4 600 1206

C8 470PF 1206

CT3 220UF E

R20 10K 1206

FER5 600 1206

C7 470PF 1206

CT2 220UF E

R21 10K 1206

CT6 10UF B

C12 0.1UF 1206

C9 270PF 805

C6 270PF 805

C93 1UF 805

C92 1UF 805

C10 0.047UF 1206

C11 0.1UF 1206

TP2

U10 AD1885

27	VREF	XTAL_IN 2	AD1803_CLKOUT
28	VREFOUT	XTL_OUT 3	
30	AFILT2	SDATA_IN 8	DIN0
29	AFILT1	SDATA_OUT 5	DT0
32	FILT_L	BIT_CLK 6	CLK0
31	FILT_R	SYNC 10	RFS0
33	RX3D	RESET 11	1885_RESET
34	CX3D	ID1 46	
		ID0 45	
		JS1 48	
		JS0 47	
22	MIC2	PC_BEEP 12	
21	MIC1	PHONE_IN 13	
24	LINE_IN_R	AUX_L 14	
23	LINE_IN_L	AUX_R 15	
36	LINE_OUT_R	VIDEO_L 16	
35	LINE_OUT_L	VIDEO_R 17	
37	MONO_OUT	CD_L 18	
		CD_R 20	
41	HP_OUT_R	CD_GND_REF 19	
39	HP_OUT_L		

AD1885JST LQFP48

C14 0.00 805

C15 DNP 805

DNP Y3 24.576MHZ OSC005

R22 10K 1206

R23 10K 1206

R25 10K 1206

R24 10K 1206

NOTE: Place MIC2 TestPoint(TP2) as close to PIN (22) as possible.

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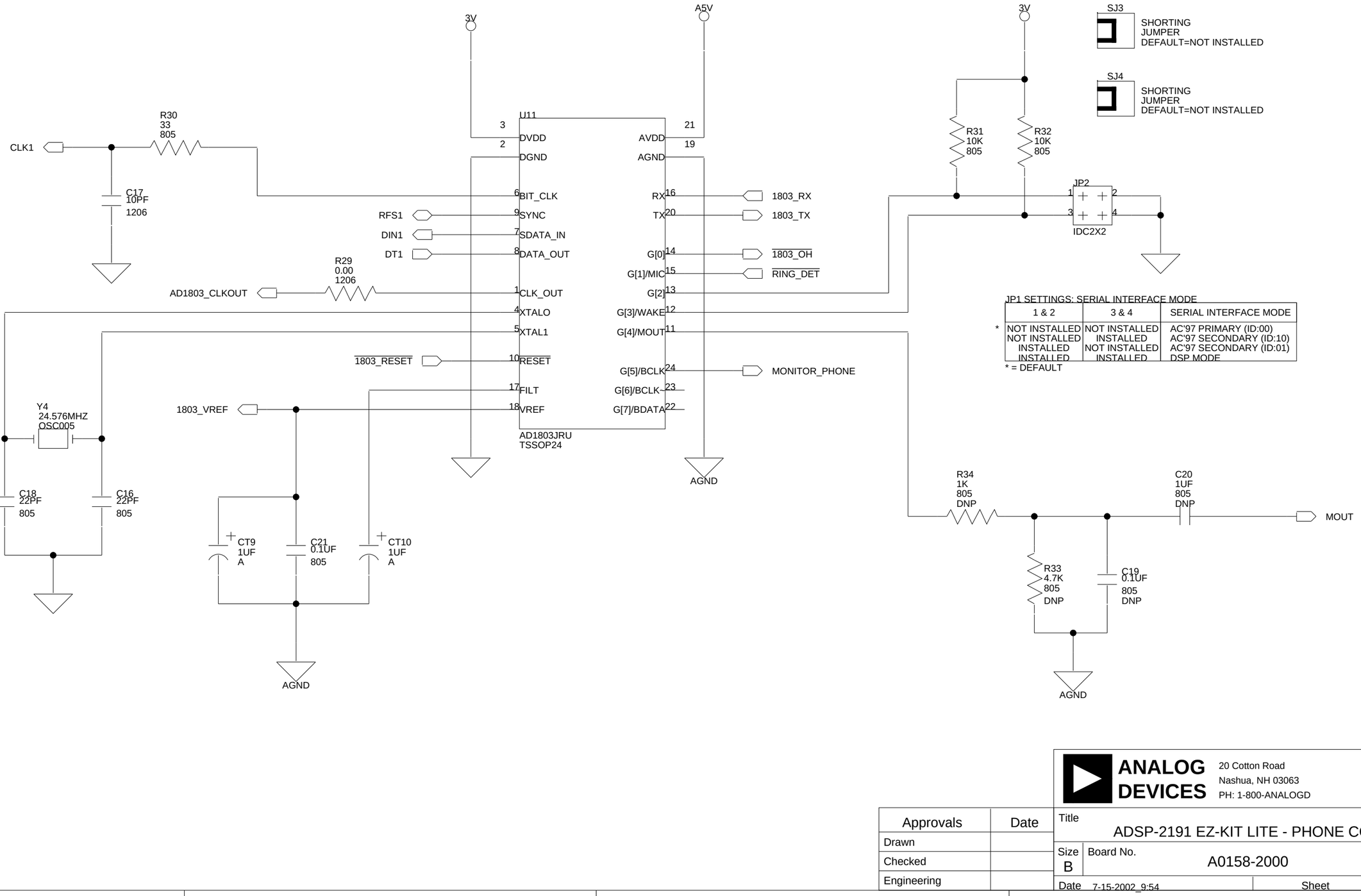
Title: ADSP-2191 EZ-KIT LITE - STEREO CODEC

Size: B | Board No.: A0158-2000 | Rev: 2.2

Date: 7-15-2002_9:54 | Sheet 4 OF 14


3V
A5V
U11
CLK1
R30
33
805
C17
10PF
1206
3
DVDD
2
DGND
6
BIT_CLK
RFS1
9
SYNC
DIN1
7
SDATA_IN
DT1
8
DATA_OUT
R29
0.00
1206
AD1803_CLKOUT
1
CLK_OUT
4
XTALO
5
XTAL1
1803_RESET
10
RESET
17
FILT
1803_VREF
18
VREF
AD1803JRU
TSSOP24
Y4
24.576MHZ
OSC005
C18
22PF
805
C16
22PF
805
CT9
1UF
A
C21
0.1UF
805
CT10
1UF
A
AGND
21
AVDD
19
AGND
RX
16
1803_RX
TX
20
1803_TX
G[0]
14
1803_OH
G[1]/MIC
15
RING_DET
G[2]
13
G[3]/WAKE
12
G[4]/MOUT
11
G[5]/BCLK
24
MONITOR_PHONE
G[6]/BCLK
23
G[7]/BDATA
22
AGND
3V
SJ3
SHORTING
JUMPER
DEFAULT=NOT INSTALLED
SJ4
SHORTING
JUMPER
DEFAULT=NOT INSTALLED
R31
10K
805
R32
10K
805
JP2
1
2
3
4
IDC2X2
JP1 SETTINGS: SERIAL INTERFACE MODE
1 & 2
3 & 4
SERIAL INTERFACE MODE
* NOT INSTALLED NOT INSTALLED AC'97 PRIMARY (ID:00)
NOT INSTALLED INSTALLED AC'97 SECONDARY (ID:10)
INSTALLED NOT INSTALLED AC'97 SECONDARY (ID:01)
INSTALLED INSTALLED DSP MODE
* = DEFAULT
R34
1K
805
DNP
C20
1UF
805
DNP
MOUT
R33
4.7K
805
DNP
C19
0.1UF
805
DNP
AGND
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20 Cotton Road
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PH: 1-800-ANALOGD
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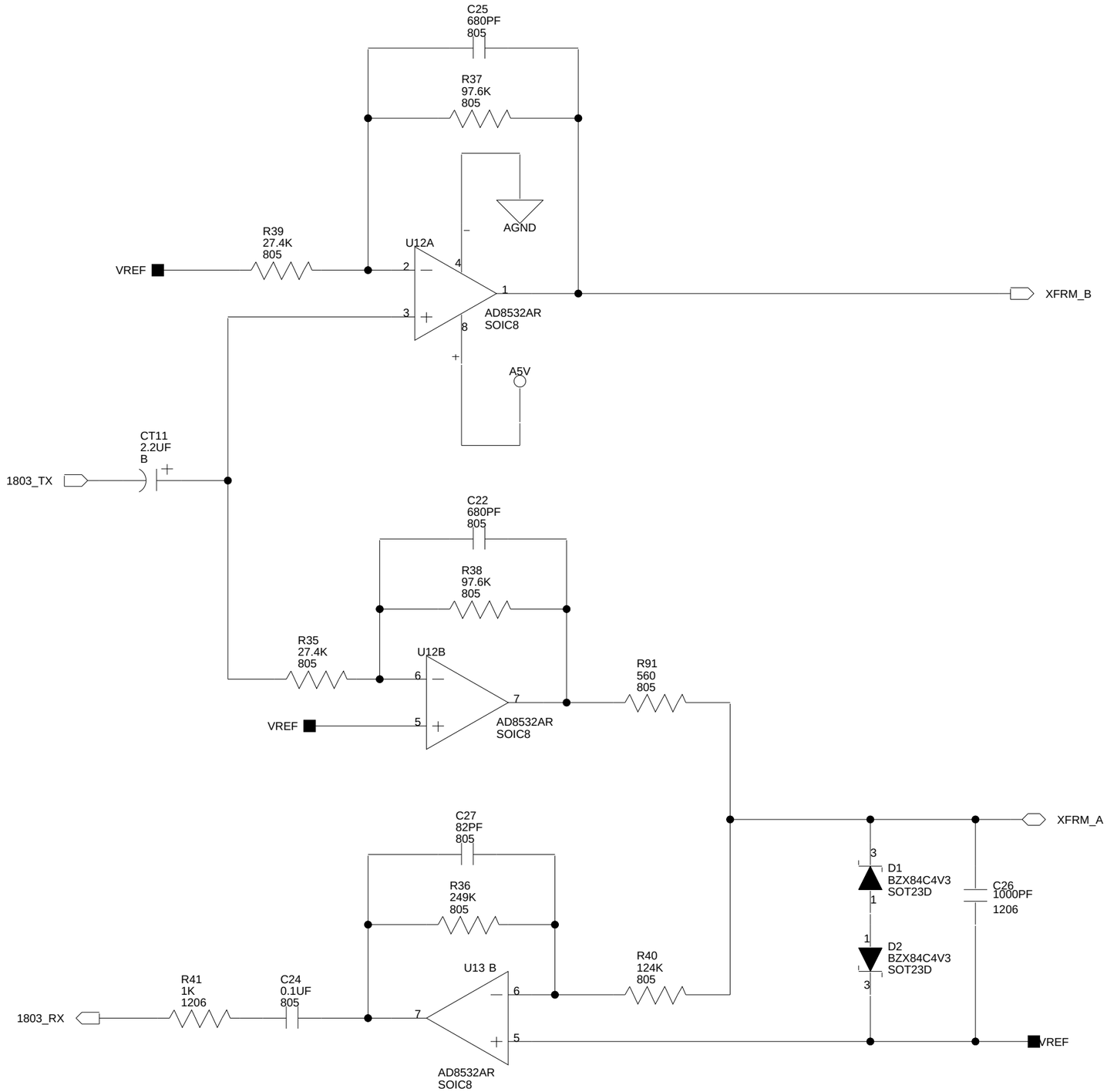
Title
ADSP-2191 EZ-KIT LITE - PHONE CODEC
Size
B
Board No.
A0158-2000
Rev
2.2
Date 7-15-2002_9:54
Sheet 5 OF 14



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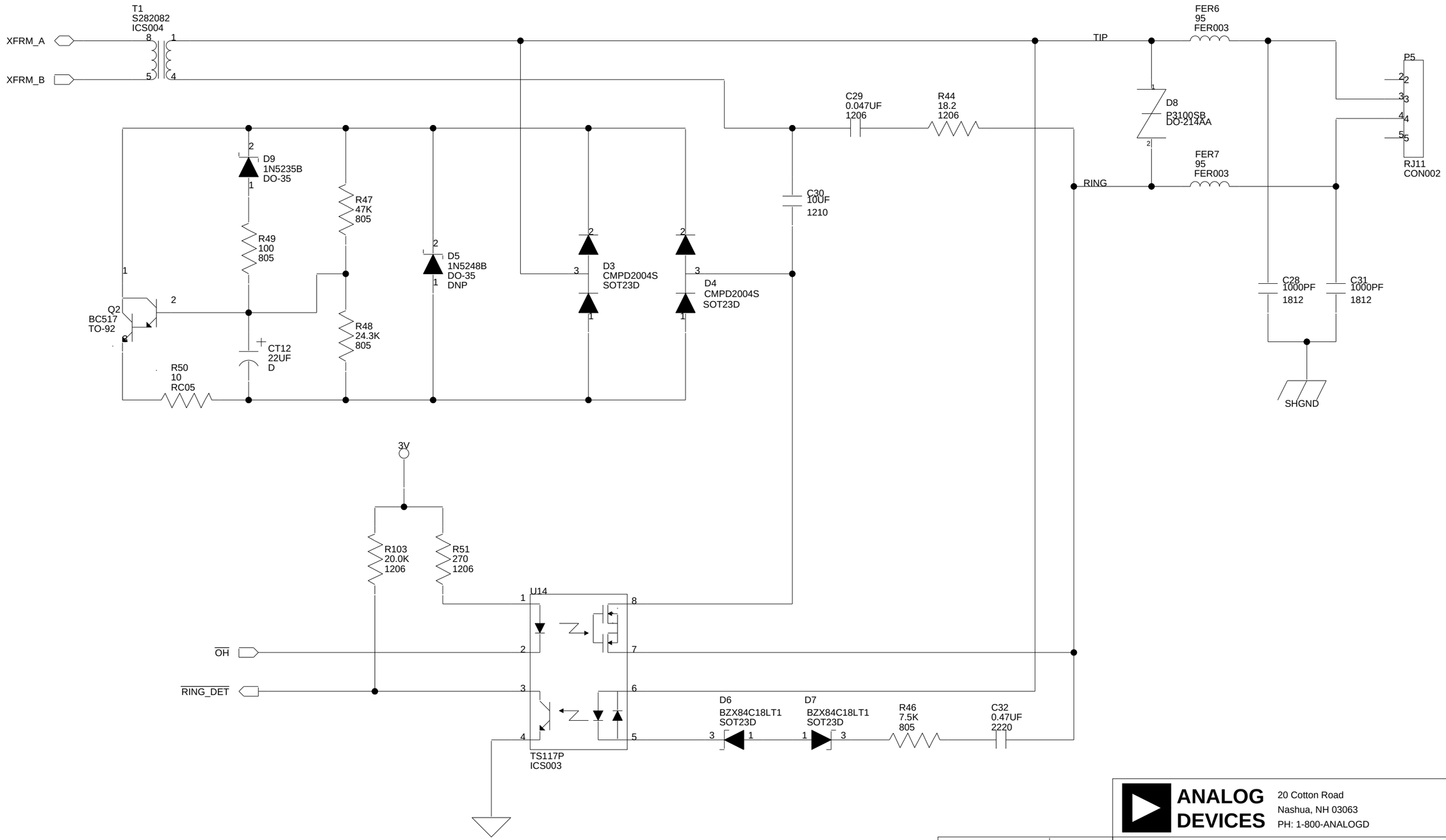
Title: ADSP-2191 EZ-KIT LITE - TELEPHONY 1

Size	Board No.	Rev
B	A0158-2000	2.2

Date 7-15-2002_9:54 Sheet 6 OF 14



Approvals	Date
Drawn	
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Engineering	

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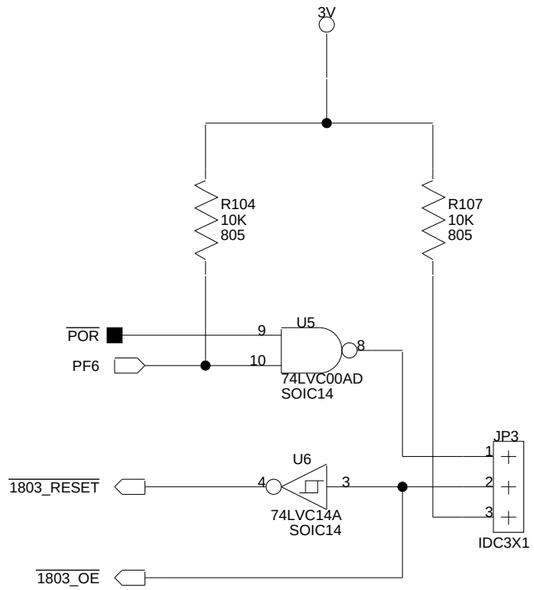
Title: ADSP-2191 EZ-KIT LITE - TELEPHONY 2

Size	Board No.	Rev
B	A0158-2000	2.2

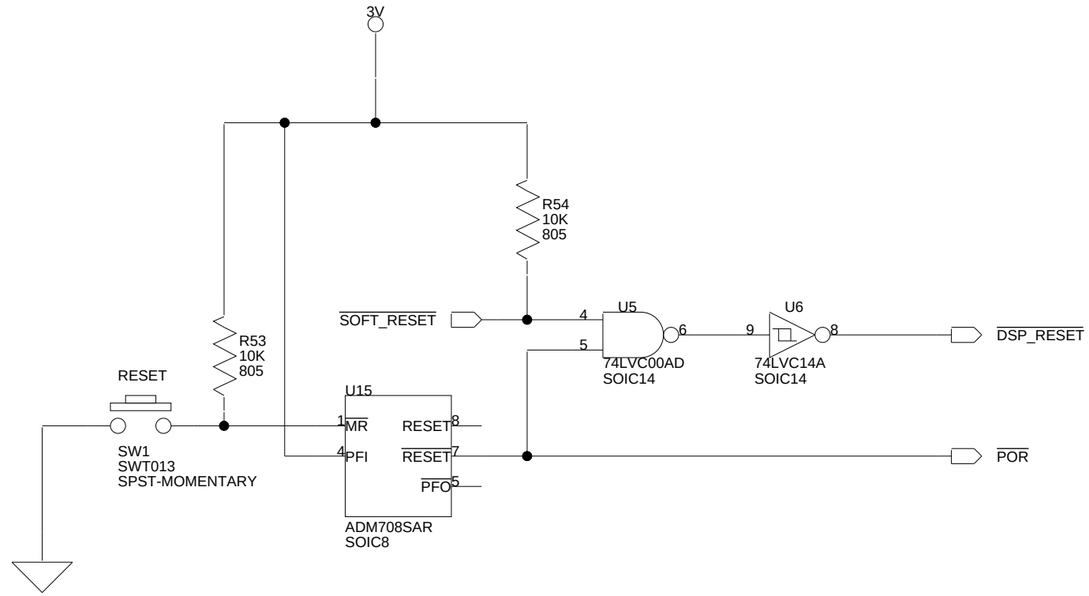
Date 7-15-2002_9:54 Sheet 7 OF 14

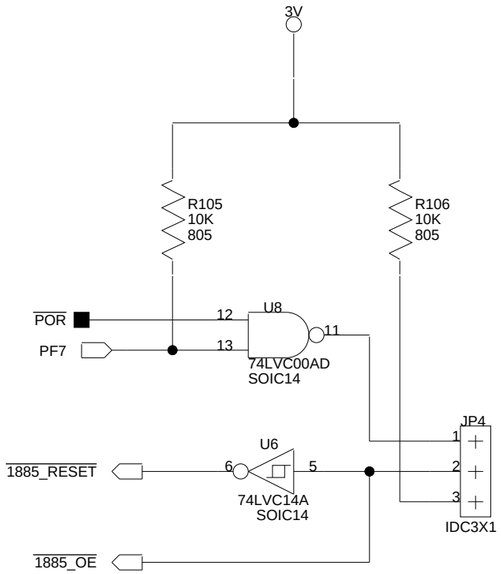


JP3: 1803 DISABLE

*	1 & 2	NORMAL OPERATION
	2 & 3	DISABLE AD1885

* = DEFAULT





JP4: 1885 DISABLE

*	1 & 2	NORMAL OPERATION
	2 & 3	DISABLE AD1885

* = DEFAULT

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Title: ADSP-2191 EZ-KIT LITE - RESET

Size	Board No.	Rev
B	A0158-2000	2.2

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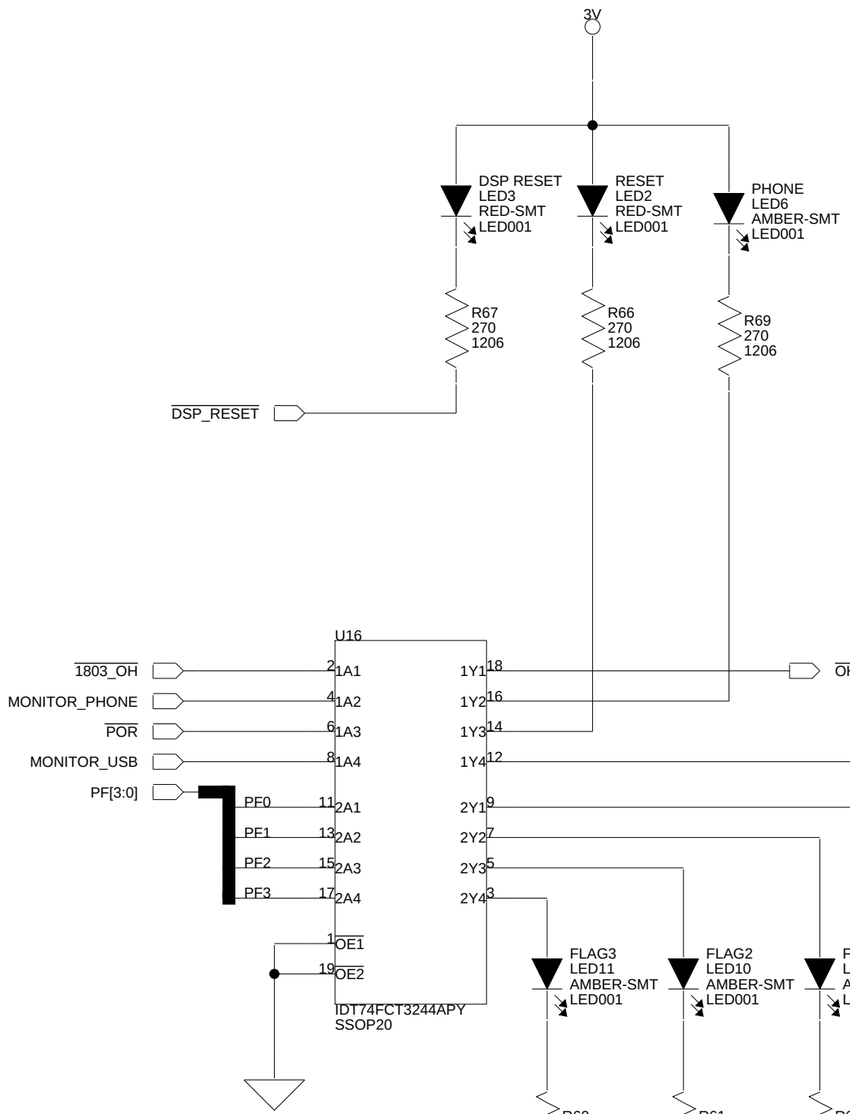

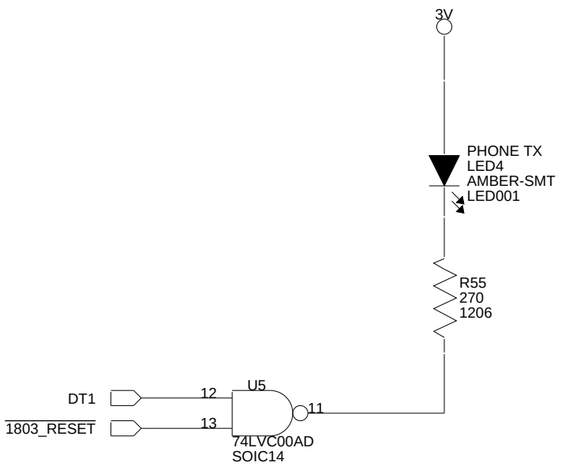

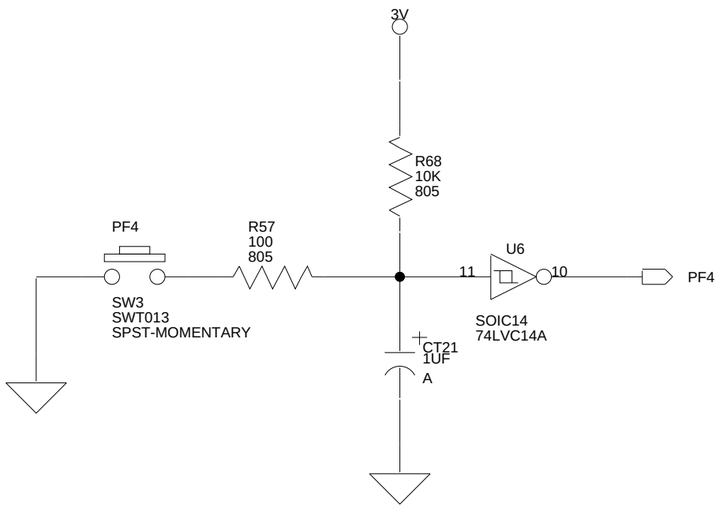

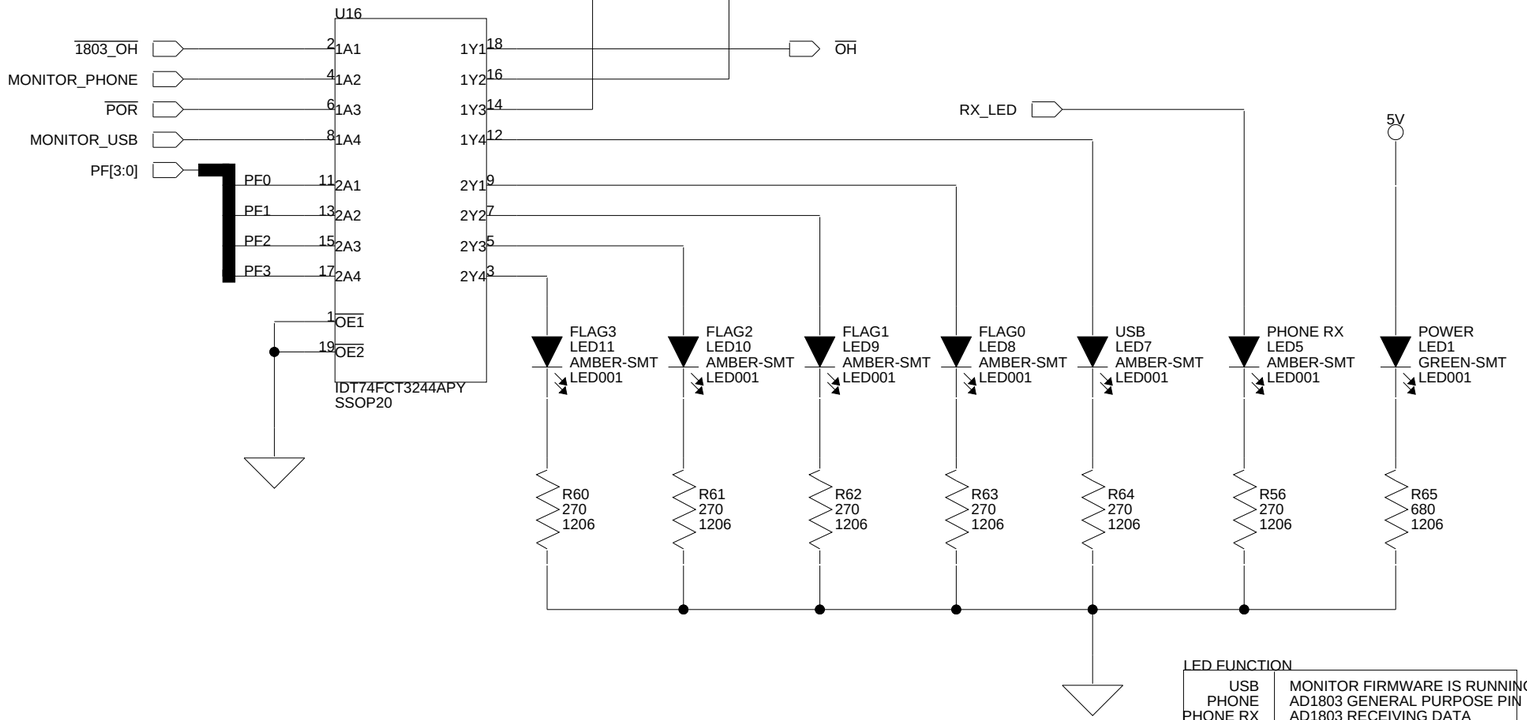

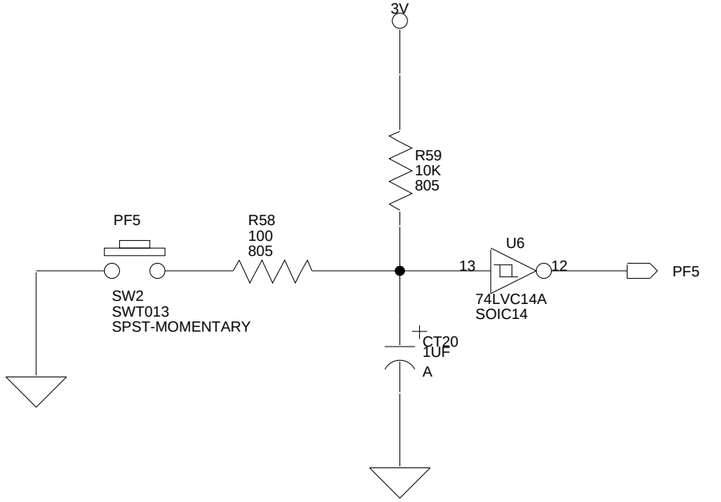

LED FUNCTION

USB	MONITOR FIRMWARE IS RUNNING
PHONE	AD1803 GENERAL PURPOSE PIN
PHONE RX	AD1803 RECEIVING DATA
PHONE TX	AD1803 TRANSMITTING DATA

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Title: ADSP-2191 EZ-KIT LITE - LED/PB

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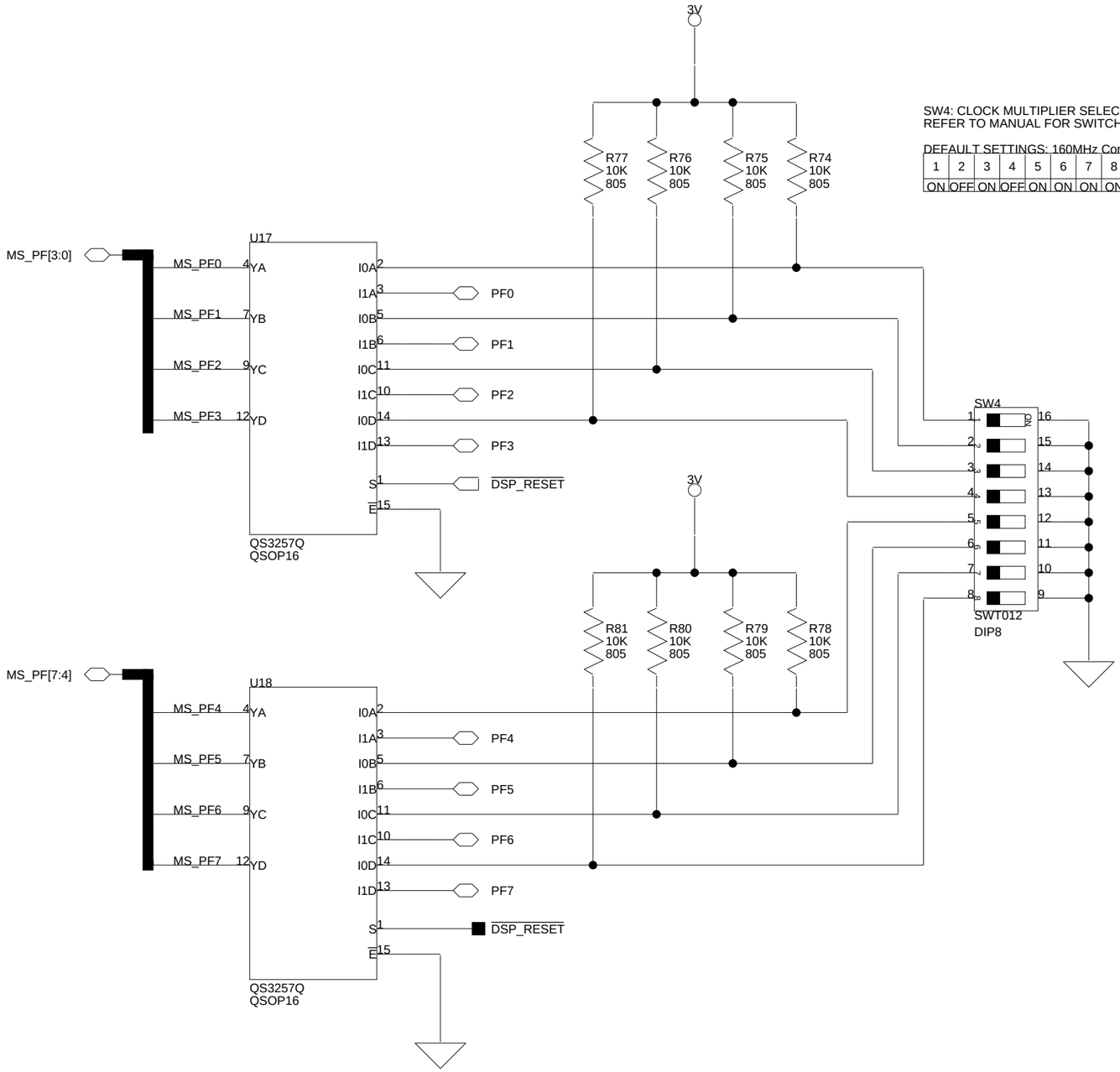
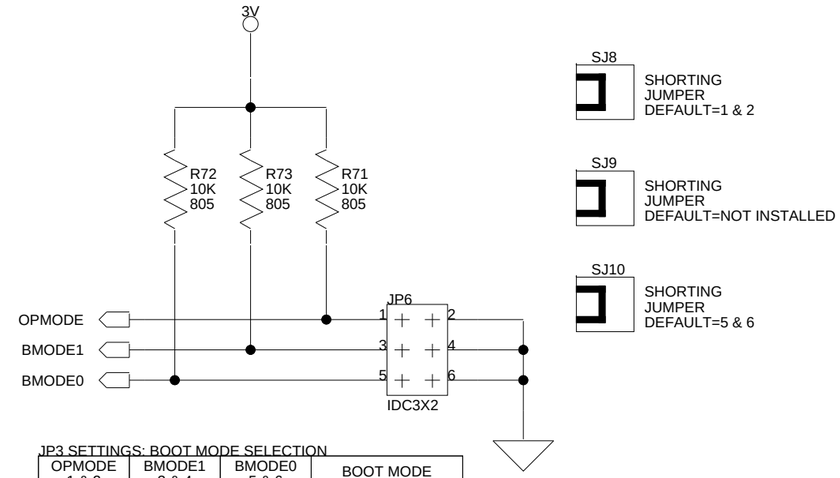




JP3 SETTINGS: BOOT MODE SELECTION

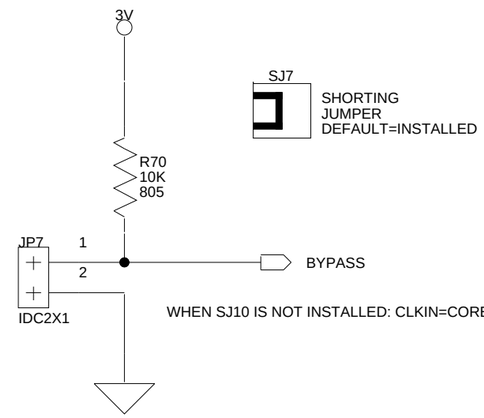
	OPMODE 1 & 2	BMODE1 3 & 4	BMODE0 5 & 6	BOOT MODE
	ON	ON	ON	EXTERNAL 16 BITS
	ON	ON	OFF	EPROM 8BITS
*	ON	OFF	ON	HOST
	ON	OFF	OFF	SPORT0
	OFF	ON	ON	EXTERNAL 8 BITS
	OFF	ON	OFF	UART
	OFF	OFF	ON	SPI 4KBITS
	OFF	OFF	OFF	SPI512K BITS

* = DEFAULT

SJ8
SHORTING
JUMPER
DEFAULT=1 & 2

SJ9
SHORTING
JUMPER
DEFAULT=NOT INSTALLED

SJ10
SHORTING
JUMPER
DEFAULT=5 & 6



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Title: ADSP-2191 EZ-KIT LITE - DSP CONFIG

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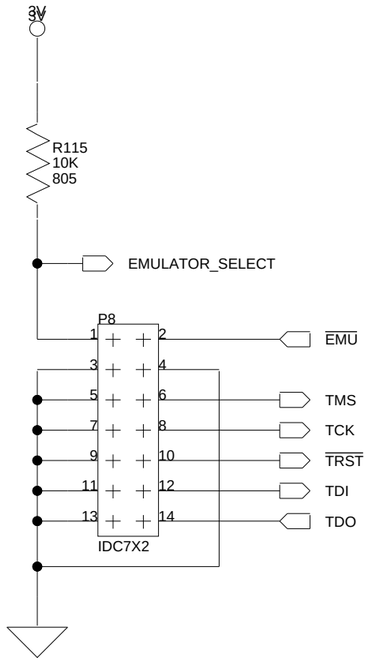
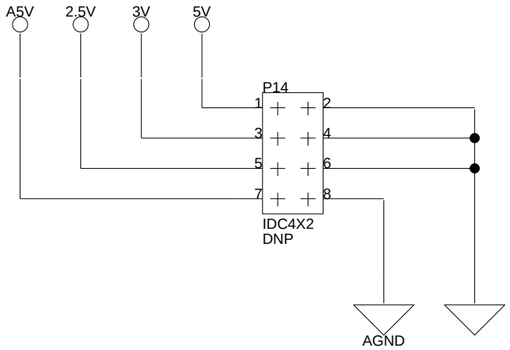
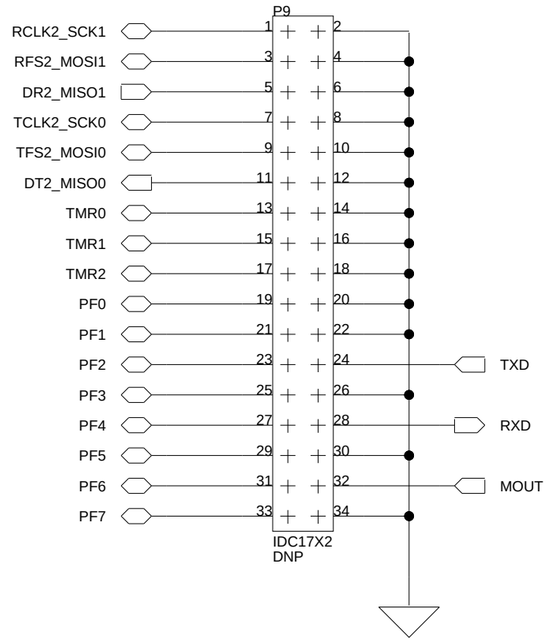


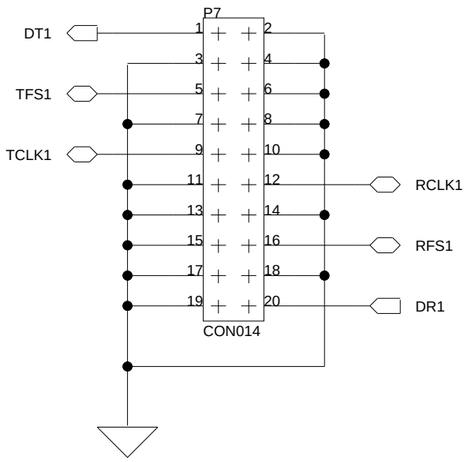
JTAG HEADER

PIN 3 SHOULD BE CUT

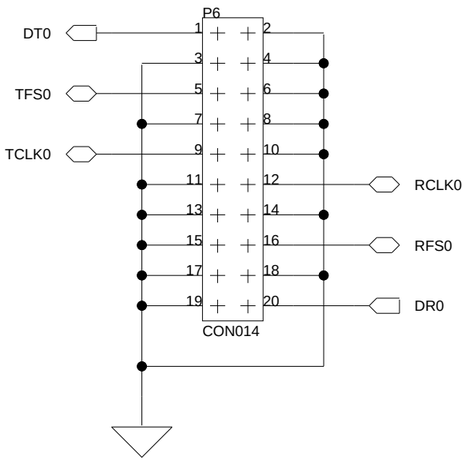




BREAD BOARD AREA



SPORT1



SPORT0

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Title: ADSP-2191 EZ-KIT LITE - CONNECTORS 1

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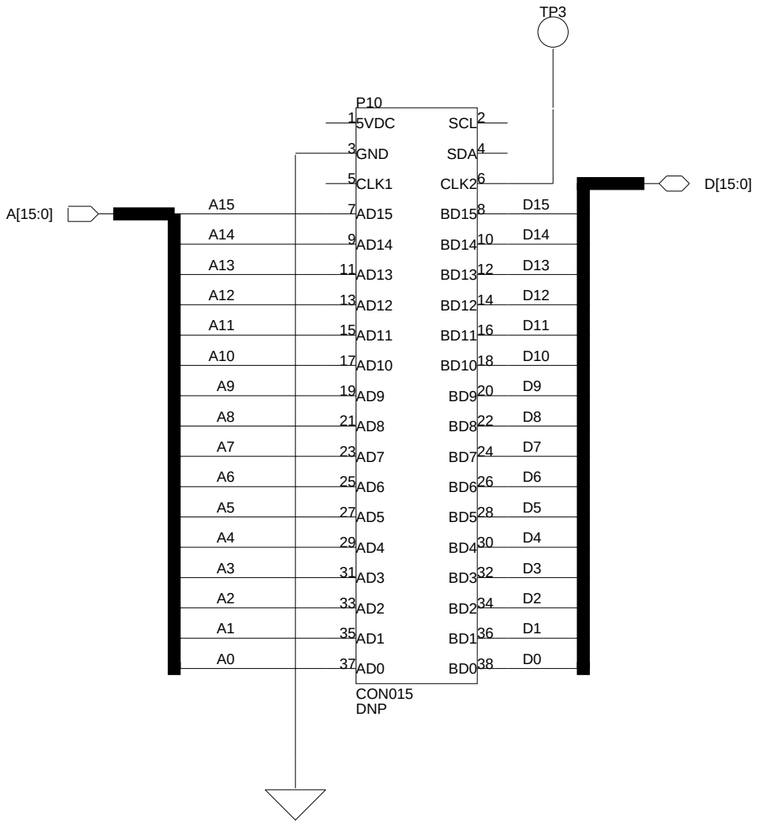
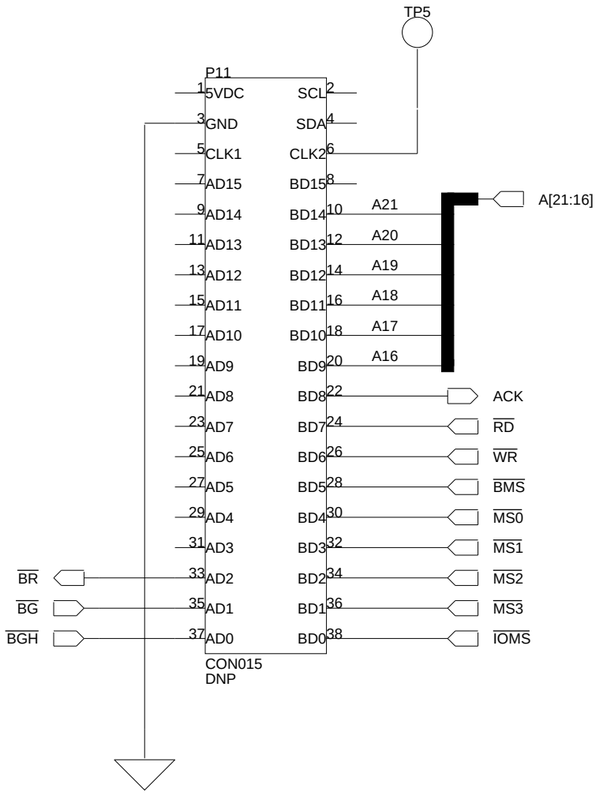
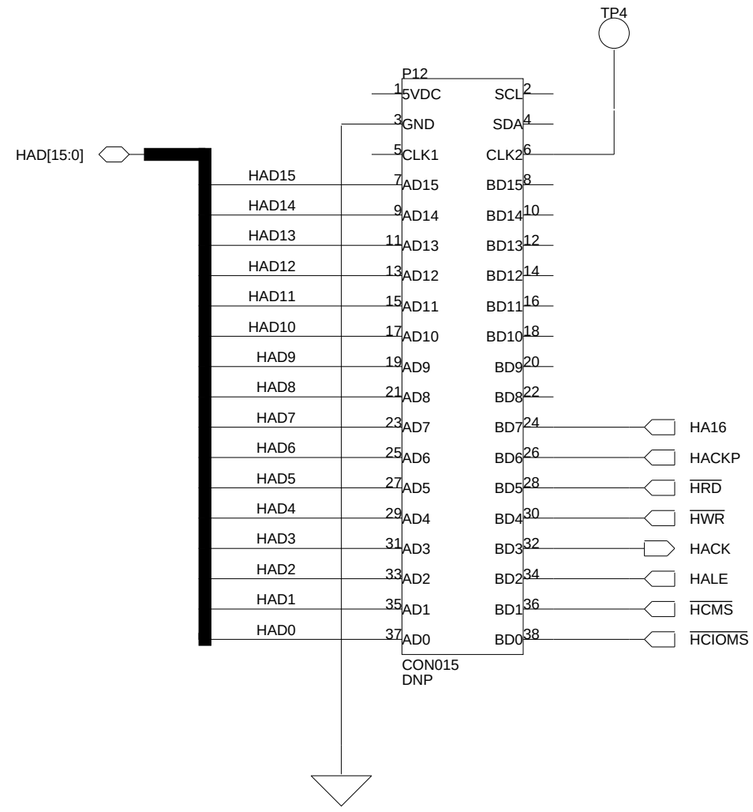


EXTERNAL MEMORY INTERFACE 1



EXTERNAL MEMORY INTERFACE 2



HOST PORT INTERFACE

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Title: ADSP-2191 EZ-KIT LITE - CONNECTORS 2

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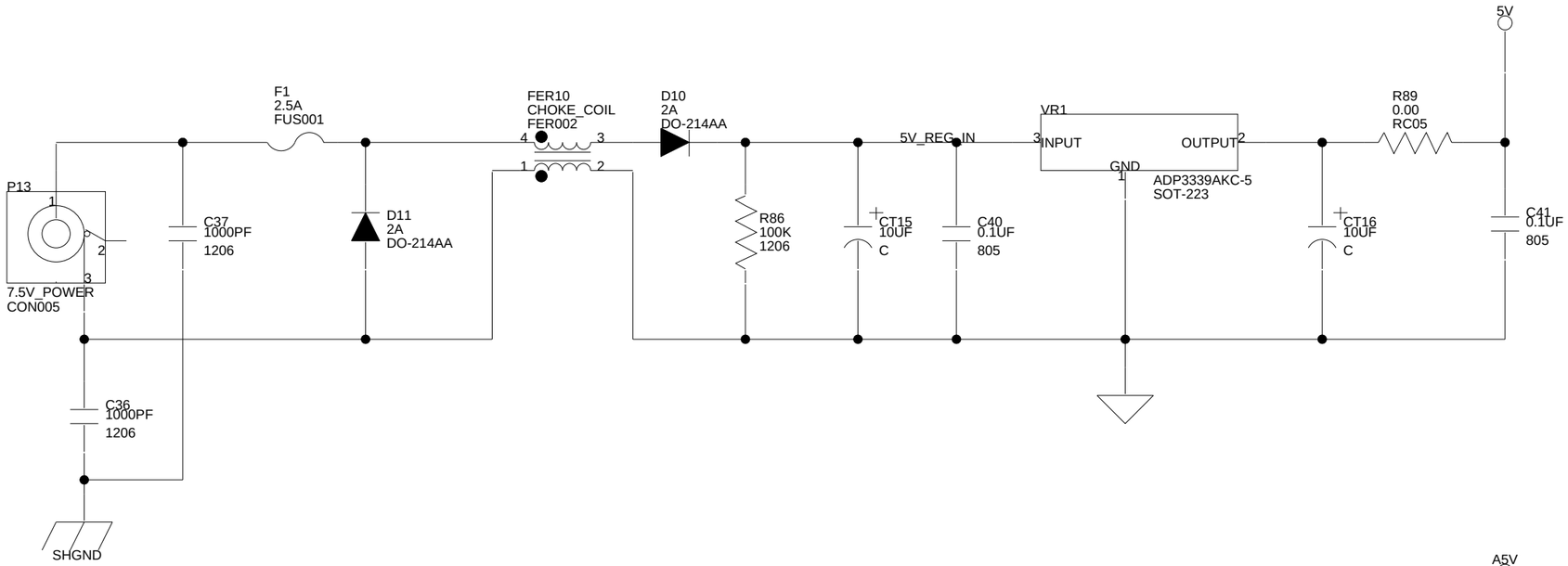
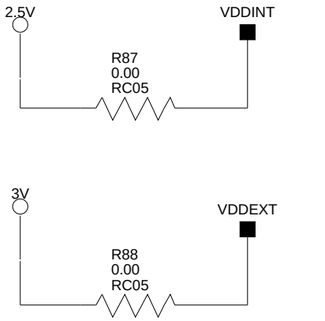
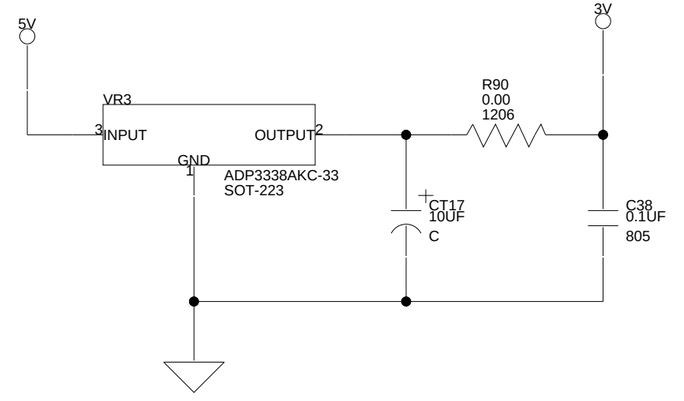
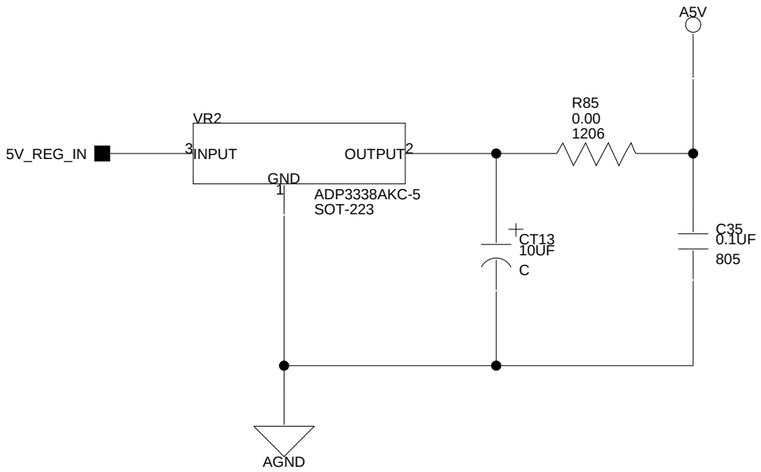
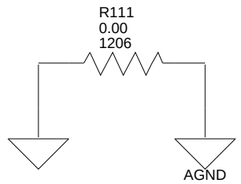


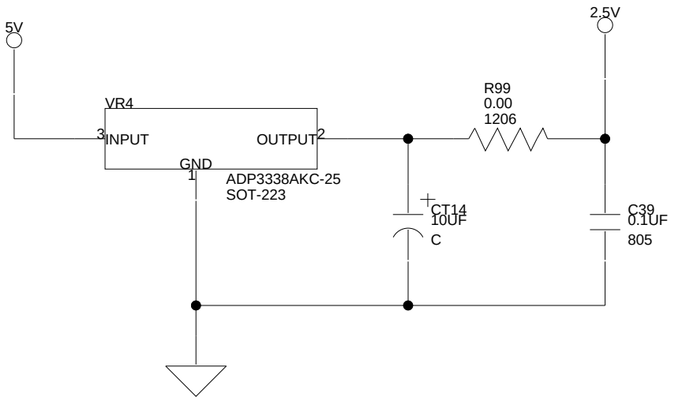
0 OHM RESISTORS TO MEASURE DSP CURRENT

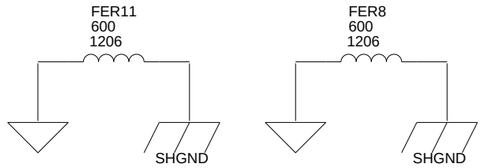












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Title: ADSP-2191 EZ-KIT LITE - POWER

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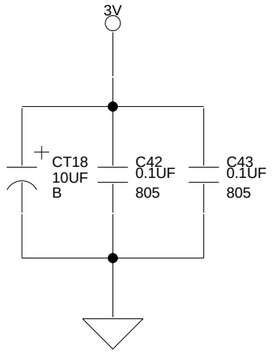
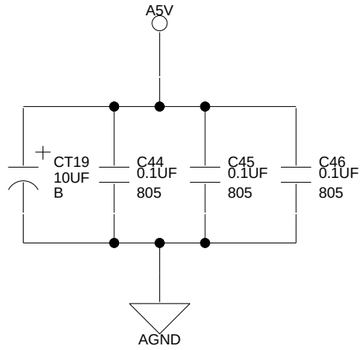


U10 (AD1885)



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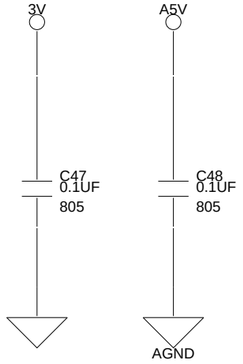

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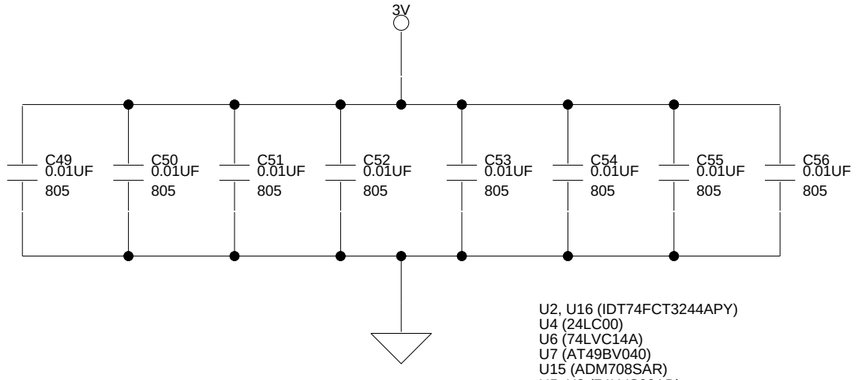
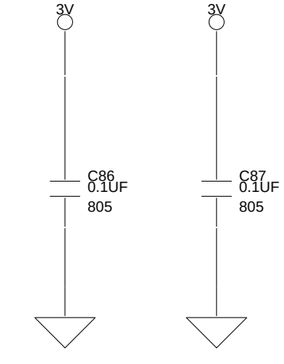


U2, U16 (IDT74FCT3244APY)
U4 (24LC00)
U6 (74LVC14A)
U7 (AT49BV040)
U15 (ADM708SAR)
U5, U8 (74LVC00AD)



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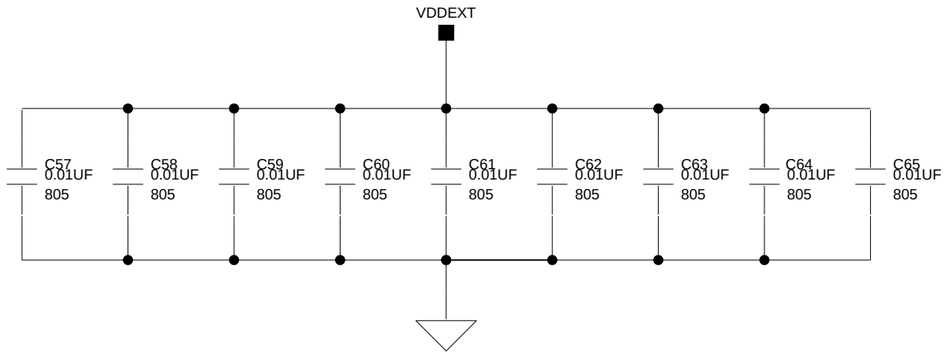

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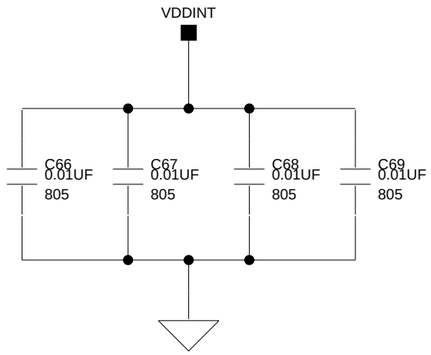

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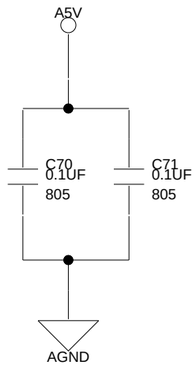

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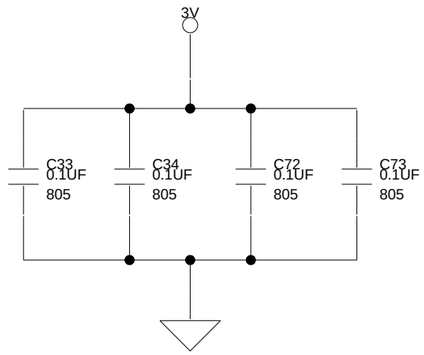
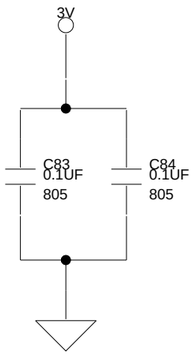
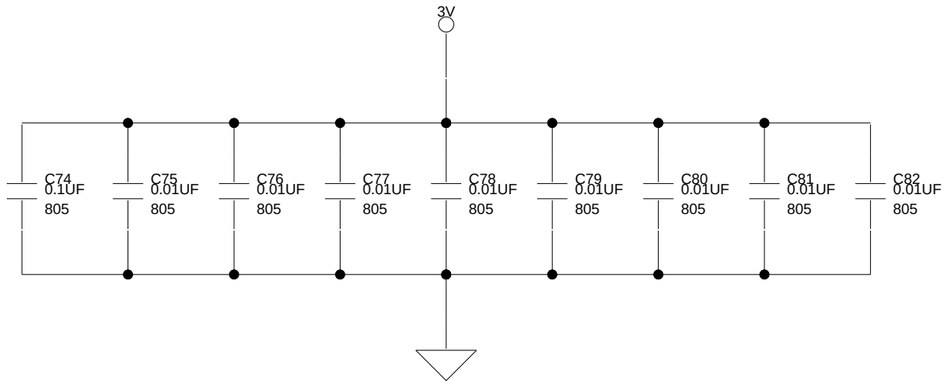


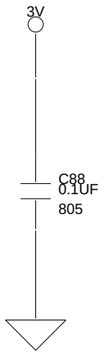
U17,U18, U23, U24(QS3257Q)



U9 (CY7C1019)



U3 (CY7C64603-128)



U21 (CY7C4421V)

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Title: ADSP-2191 EZ-KIT LITE - BYPASS CAPS

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