ADSP2192-12 EZ-KIT LITE™ EVALUATION SYSTEM MANUAL

ANALOG DEVICES

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C E   <u>**Regulatory Compliance**</u>

The ADSP2192-12 EZ-KIT Lite has been certified to comply with the essential requirements of the European EMC directive and therefore carries the "**CE**" mark.

Technical Certificate No: EA1209-1

Issued by: Curtis-Straus LLC
                               527 Great Road
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The EZ-KIT Lite evaluation board contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Unused EZ-KIT Lites should be stored in the protective shipping package.

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1 INTRODUCTION

Thank you for purchasing the ADSP2192-12 EZ-KIT Lite™ evaluation kit. The evaluation board is designed to be used in conjunction with the VisualDSP® development environment and is based on the ADSP2192-12 fixed-point digital signal processor (DSP). The kit is shipped with an evaluation board and the VisualDSP software. Using the EZ-KIT Lite in conjunction with the VisualDSP environment and the debug monitor running on the EZ-KIT Lite evaluation board, gives users the ability to perform advanced application code development and debug such as:

- Create, compile, assemble, and link application programs written in C and ADSP-219x assembly

- Load, run, step in, step out, step over, halt, and set break points in application programs

- Read and write data and program memory

- Read and write core and peripheral registers

- Plot memory

Access to the ADSP2192-12 processor is achieved via the PC through the PCI bus communicating with the debug monitor or an optional JTAG emulator. The JTAG emulator allows the PC to perform in-circuit emulation through the processor's JTAG interface. The JTAG emulators perform debugging at a much faster rate and provide many advanced debug features that are not available with the ADSP2192-12 debug monitor. JTAG emulators can be purchased separately through Analog Devices.

The board's features include:

- Analog Devices ADSP2192-12 DSP running at 33MHz

- Analog Devices AD1885 AC'97 SoundPort® codec

- Jumper Selectable Line-In or Mic-In via 1/8" Stereo Jack.

- 1/8" Stereo Jack for Headphone Out

- Socket for Optional Serial EEPROM

- PCI version 2.2 Compliant Interface

- USB version 1.1 Compliant Hardware Interface with Connector

- Selectable PCI (Plug-In card) Operation, USB Operation (optional), or Stand Alone Operation (optional)

- Two push buttons for GPIO inputs

- Two user programmable LEDs

- 14 Pin Connector for JTAG Emulator Interface

- User Installed expansion header

- Small (2.5" x 3.5") breadboard area with typical SMT footprints provided.

The EZ-KIT Lite board is equipped with hardware that facilitates interactive demonstrations. The push button switches and user programmable LEDs provide user control and board status. The AD1885 AC'97 SoundPort® codec provides access to an audio input (selectable as line level or microphone) and an audio output (head phone out). Additionally, by installing an optional expansion connector the user can add additional AC'97 compliant devices, as well as gaining access to the general purpose I/Os (GPIOs) pins.

1.1 For More Information About Analog Devices, Inc. Products

Analog Devices is accessible on the Internet at www.analog.com. The DSP web page is directly accessible at www.analog.com/dsp. This page provides access to DSP specific technical information and documentation, product overviews, and product announcements.

1.2 For Technical or Customer Support

You can reach our Customer Support group in the following ways:

- Email questions to dsptools.support@analog.com

- Contact your local Analog Devices sales office or an authorized Analog Devices distributor

1.3 Purpose of This Manual

The ADSP2192-12 EZ-KIT Lite Evaluation System Manual provides directions for installing the EZ-KIT Lite hardware and software on your PC. Also, this manual provides guidelines for running your own code on the ADSP2192-12.

1.4 Intended Audience

This manual is a user's guide and reference to the ADSP2192-12 EZ-KIT Lite™ evaluation board. DSP programmers who are familiar with Analog Devices fixed-point architecture, operation, and programming are the primary audience for this manual.

DSP programmers who are unfamiliar with Analog Devices DSPs can use this manual, but should supplement this manual with the ADSP2192-12 User's Manual, the ADSP-219x Technical Reference, and the VisualDSP tools manuals. These documents describe the Analog Devices DSP architecture, DSP instruction set, and development tools.

1.5 Manual Contents Description

This manual contains the following information:

- Chapter 1 — Introduction

    Provides manual information and Analog Devices contact information.

- Chapter 2 — Getting Started

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

- Chapter 3 — Using EZ-KIT Lite Software

    Provides information on the EZ-KIT Lite system from a software perspective, and details the monitor program and codec.

- Chapter 4 — Working With EZ-KIT Lite Hardware

    Provides information on the Hardware aspects of the evaluation system.

- Appendix A — Bill of Materials

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

- Appendix B — Schematics

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

1.6 Documents and Related Products

For more information on the ADSP2192-12 and the components of the EZ-KIT Lite system, see the following documents:

ADSP-2192 Reference:	Part Number:
ADSP2192-12 User's Manual	82-000510-01
ADSP-219x DSP Instruction Set Reference	82-000390-07
AC'97 Codec Reference	C00753-2.5-7100 (rev. 0)
VisualDSP Reference:	**Part Number:**
Installation Quick Reference Card	82-000349-06
C Compiler & Library Manual for ADSP-219x Family DSPs	82-000390-03
Assembler Manual for ADSP-219x Family DSPs	82-000390-04
Product Bulletin for VisualDSP 7.0 & ADSP-219x Family DSPs	82-000390-05
C Compiler & Library Manual for ADSP-218x Family DSPs	82-000400-03
Assembler Manual for ADSP-218x Family DSPs	82-000400-04
Product Bulletin for VisualDSP 7.0 & ADSP-218x Family DSPs	82-000400-05
VisualDSP User's Guide for ADSP-21xx Family DSPs	82-000349-01
Linker & Utilities Manual for ADSP-21xx Family DSPs	82-000349-02

The ADSP-219x family of processors is supported by a complete set of development tools. Software tools include a C compiler, assembler, runtime libraries and librarian, linker, simulator, and PROM splitter. These tools are described in the *ADSP-219x Family Hardware and Software Development Tools Data Sheet*, the *VisualDSP User's Guide & Reference*, and the *C Compiler Guide & Reference for the ADSP-219x Family DSPs*.

If you plan to use the EZ-KIT Lite in conjunction with the JTAG ICE emulator, refer to the documentation that accompanies that product.

2 GETTING STARTED

2.1 Overview

This chapter provides you with the information you need to install your software and the ADSP2192-12 EZ-KIT Lite evaluation board. It is important that you install your software and hardware in the order presented for correct operation.

2.2 Contents of Your EZ-KIT Lite Package

The EZ-KIT Lite evaluation board contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Unused EZ-KIT Lites should be stored in the protective shipping package.

Your ADSP2192-12 EZ-KIT Lite evaluation board package should contain the following items. If any item is missing, contact the vendor where you purchased your EZ-KIT Lite or Analog Devices.

- ADSP2192-12 EZ-KIT Lite board
- CD containing the EZ-KIT Lite software (PCI monitor, source, and examples)
- CD containing VisualDSP evaluation package for the ADSP2192-12 EZ-KIT Lite
- ADSP2192-12 Anomaly Sheet
- Registration card - *please fill out and return*

2.3 PC Configuration

For correct operation of the VisualDSP software and the EZ-KIT Lite, your computer must have the minimum configuration shown below.

Windows 95, release 95b or later, Windows 98, Windows 2000, or Windows NT, release 4.0, Service Pack 3 or later
One available PCI slot
Pentium processor 166 MHz or faster
VGA Monitor and color video card
2-button mouse
100 MB available space
32 MB RAM
CD-ROM

Table 2-1: Minimum PC Configuration

2.4 VisualDSP

The ADSP2192-12 EZ-KIT Lite system is shipped with the VisualDSP Integrated Development Environment (IDE), debugger and code generation tools. VisualDSP is limited in functionality by the EZ-KIT Lite license that is shipped with this product. The EZ-KIT Lite License restricts the VisualDSP debugger to only connect to the ADSP2192-12 EZ-KIT Lite evaluation board running the debug monitor via the PCI bus (no emulator or simulator support). If the full VisualDSP software suite is purchased, the user will obtain a new license string and validation code from Analog Devices that will lift the restrictions mentioned above. The basic components that are shipped with VisualDSP are:

- Integrated Development Environment (IDE) — graphical interface for project management, allowing the user to set project options, access the code generation tools, and launch the debugger.

- Debugger — allows the user to view the insides of the DSP and perform debug operations such as read/write memory, read/write registers, load programs, run, step, halt, and more.

- ADSP-219x Family Code Generation Tools — C compiler, assembler, runtime libraries and librarian, linker, simulator, and PROM splitter.

- Example Projects — Both VisualDSP and the ADSP2192-12 EZ-KIT Lite are shipped with example projects and C and Assembly source code that demonstrate various features of the tools and ADSP2192-12 fixed point DSP.

2.5 Installation Procedures

The following procedures are provided to ensure reliable operation of the ADSP2192-12 evaluation board. It is important that you follow these instructions in the order presented to ensure correct operation of your software and hardware.

2.5.1 Installing the EZ-KIT Lite Hardware

The ADSP2192-12 EZ-KIT Lite board is designed to run inside your personal computer. You will have to access the inside of your computer in order to install the board. Use the following steps to configure the EZ-KIT Lite:

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. Make sure the switch (SW4) is in the right position for PCI operation.

SW4

PCI
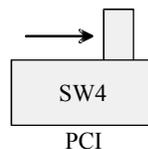
NOTE: Do not change the position of this switch while power is applied to the board. This could damage some of the components on the board.

3. Make sure jumper JP1 is installed correctly. For PCI, JP1 should have jumpers installed on Pins 1 & 2 and Pins 3 & 4. Refer to Hardware Section (Section 4.5) of this manual if more information of jumper settings is required.

4. In order to configure your board to take advantage of the audio capabilities, use the following procedure:

   a) Place the appropriate jumpers on JP4. The default is Line In, and the jumpers should be placed on Pins 3 & 5 and Pins 4 & 6, respectively.

   b) If Mic In operation is required, then Jumpers on JP4 should be placed on Pins 1 & 3 and Pins 2 & 4, respectively.

   c) If more information is required, please see the Hardware Section (Section 4.5.4) of this manual.

5. Find an empty PCI slot in your computer and place the ADSP2192-12 EZ KIT Lite in the empty PCI slot. (Turn off power to your PC first)

6. Screw in bracket so that the board has a strong and direct contact to the chassis ground of the computer, and PCI contacts are seated securely.

7. If audio capabilities are being used then connect a 1/8" cable from a self powered speaker into the 1/8" Audio Jack on the bracket of the EZ-KIT Lite. This is labeled as "OUT" on the bracket.

8. Connect a Microphone or the appropriate Line In cable into the 1/8" Audio Jack on the bracket of the EZ-KIT Lite. This is labeled as "IN" on the bracket.

9. Turn on computer and verify that the PCI LED (green) on the bracket of the EZ-KIT Lite turns on. This indicates that SW4 is in correct position and that the board is successfully being powered by the computer's PCI bus.

10. Once the PC is running, Windows should detect new hardware and will ask for the appropriate drivers for the board. Please refer to "Installing PCI Drivers" section of the "Installing the EZ-KIT Lite Software" below.

This completes the hardware installation.

2.5.2 Installing the EZ-KIT Lite Software

2.5.2.1 Installing PCI Drivers

You must install the drivers prior to using the PCI interface with the VisualDSP debugger. The next few sections will walk you through installing the proper driver for your system.

2.5.2.1.1 Installing the Windows 95 Driver

Upon rebooting for the first time after the inserting the EZ-KIT Lite the Windows 95 Add New Hardware Wizard should start up. If it does not you may manually run it by hitting the Start button on the Windows taskbar. Then choose Settings and Control Panel. Double click on the "Add New Hardware" icon.

1. The wizard should detect the EZ-KIT Lite as shown in figure 2-1. Click *Next* to continue.

Figure 2-1: Windows 95 Add New Hardware Wizard detected the EZ-KIT Lite.

2. The wizard will search for a driver for the EZ-KIT Lite. If this is the first time installing the driver Windows will not find an existing one as shown in figure 2-2. Insert the EZ-KIT Lite CD into the CD-ROM drive. Click *Other Locations…* to search for the driver manually.

Figure 2-2: The wizard did not find an existing driver for the EZ-KIT Lite.

3. The *Select Other Location* dialog will appear. Enter the drive letter of your CD-ROM drive followed by the path to the Windows 95 driver as shown in figure 2-3 then click *OK* to continue.

Figure 2-3: In the *Select Other Location* dialog enter the path to the Windows 95 driver.

4. The wizard should detect the driver's information file (INF) in the Win95 folder as shown in figure 2-4. Click *Finish* to continue.

Figure 2-4: The wizard detects the driver information file.

5. The wizard will prompt you for the location on the device driver as shown in figure 2-5.
   It is located in the same folder as the INF file. Make sure the path is entered properly and click *OK* to complete the driver installation.

Figure 2-5: Specify the location of the device driver.

6. Reboot the system before attempting to run the debugger over the PCI interface.

2.5.2.1.2 Installing the Windows 98 Driver

Upon rebooting for the first time after the inserting the EZ-KIT Lite the Windows 98 Add New Hardware Wizard should start up. If it does not you may manually run it by hitting the Start button on the Windows taskbar. Then choose Settings and Control Panel. Double click on the "Add New Hardware" icon.

1. The wizard should detect the EZ-KIT Lite as shown in figure 2-6. Click *Next* to continue.

Figure 2-6: Windows 95 Add New Hardware Wizard detected the EZ-KIT Lite.

2. Select *Search for the best driver for your device* as shown in figure 2-7. Insert the EZ-KIT Lite CD into the CD-ROM drive and click *Next* to continue.

Figure 2-7: Tell the wizard to search for the driver.

3. The wizard will prompt you for where to search. Check only
   Specify a location and enter the drive letter of your CD-ROM drive
   followed by the path to the Windows 98 driver as shown in figure
   2-8 then click *Next* to continue.

Figure 2-8: Enter the path to the Windows 98 driver.

4. The wizard should detect the driver's information file (INF) in the Win98 folder as shown in figure 2-9. Click *Next* to continue.

Figure 2-9: The wizard detects the driver information file.

5. The wizard will prompt you for the location on the device driver as shown in figure 2-10. It is located in the same folder as the INF file. Make sure the path is entered properly and click *OK* to complete the driver installation.
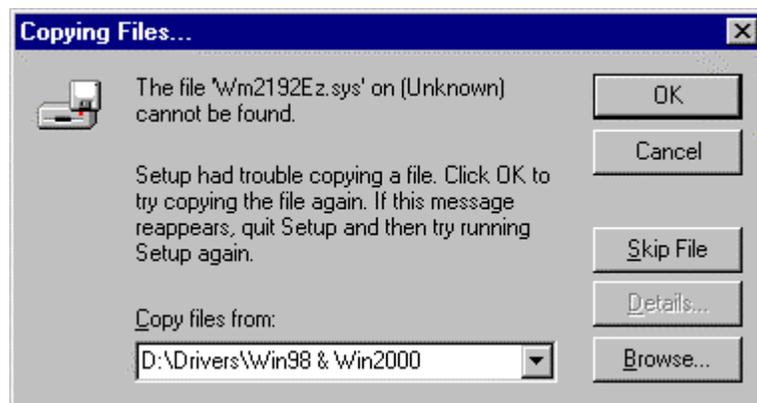
Figure 2-10: Specify the location of the device driver.

6. This will complete the driver installation as shown in Figure 2-11. Click finish to exit the wizard.

Figure 2-11: The driver has been installed successfully.

7. Reboot the system before attempting to run the debugger over the PCI interface.

2.5.2.1.3 Installing the Windows NT Driver

The Windows NT driver will automatically be installed during the installation of the EZ-KIT Lite debug software. No additional steps are needed to run under Windows NT.

2.5.2.1.4 Installing the Windows 2000 Driver

Upon rebooting for the first time after the inserting the EZ-KIT Lite the Windows 2000 Add New Hardware Wizard should start up. If it does not you may manually run it by hitting the Start button on the Windows taskbar. Then choose Settings, Control Panel, then Add/Remove Hardware. Click Next and Next again to continue.

1. The wizard should detect the EZ-KIT Lite as shown in figure 2-12. Click *Next* to continue.

Figure 2-12: Windows 2000 Found New Hardware Wizard detected the EZ-KIT Lite.

2. Select *Search for a suitable driver for my device* as shown in figure 2-13. Insert the EZ-KIT Lite CD into the CD-ROM drive and click *Next* to continue.

Figure 2-13: Tell the wizard to search for the driver.

3. The wizard will prompt you for where to search as shown in figure 2-14. Check only *Specify a location* and click *Next* to continue.
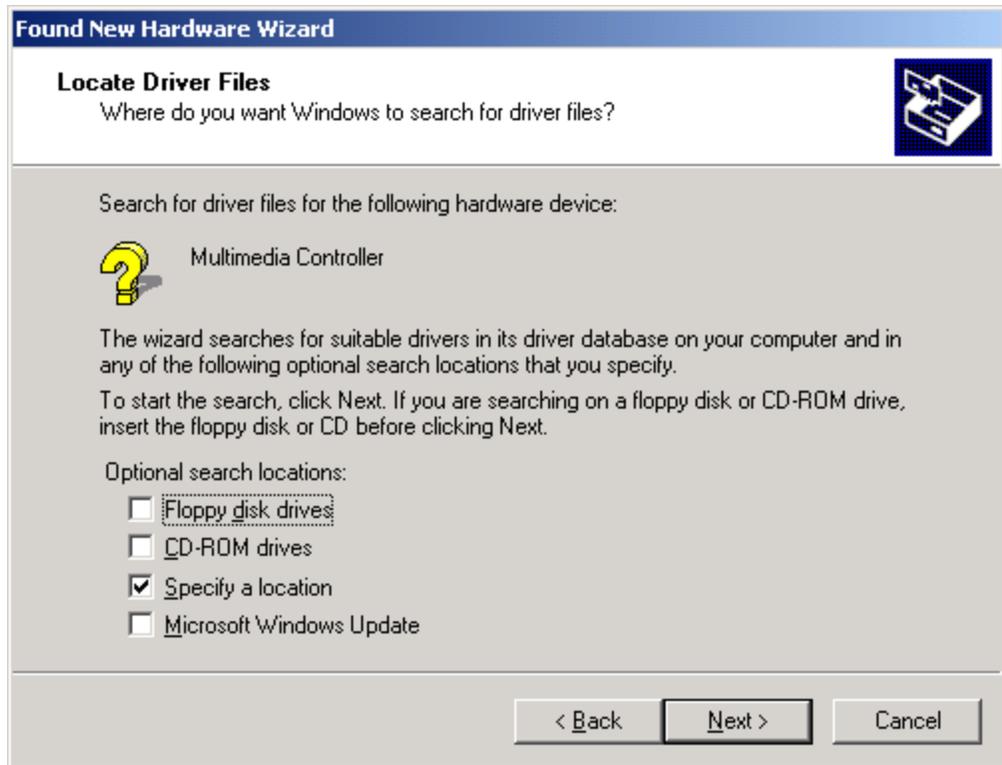
Figure 2-14: Tell the wizard you will specify where to look for the driver.

4. Enter the drive letter of your CD-ROM drive followed by the path to the Windows 2000 driver as shown in figure 2-15 then click *OK* to continue.

Figure 2-15: Specify the location of the device driver.

5. The wizard should detect the driver's information file (INF) in the Win2000 folder as shown in figure 2-16. Click *Next* to continue.
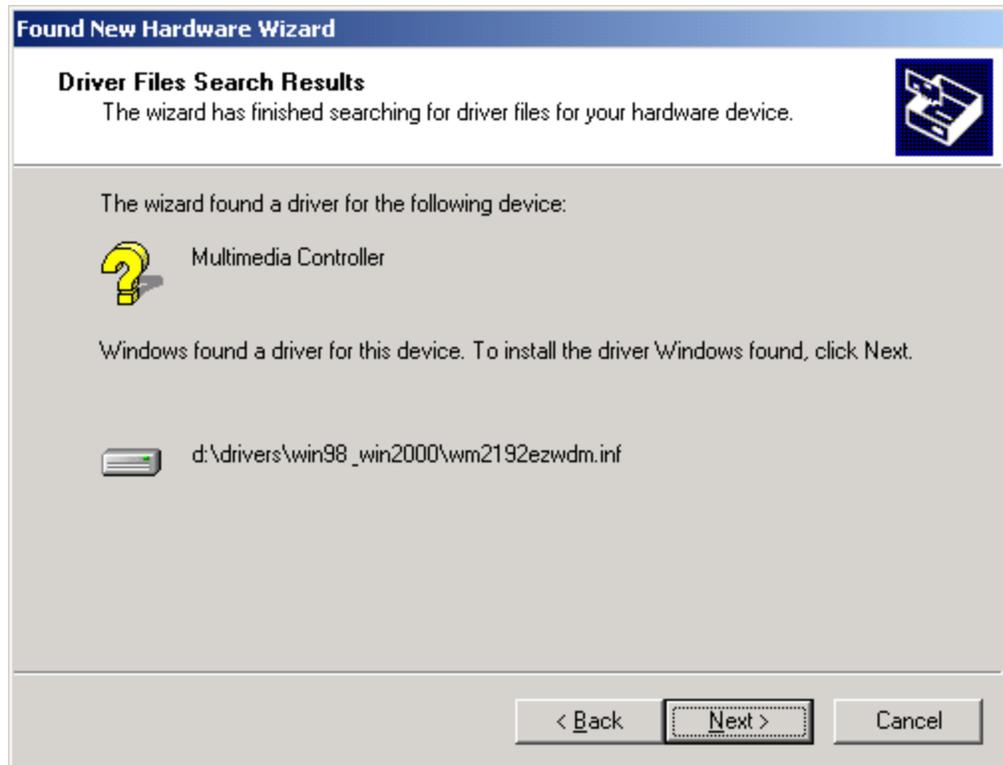
Figure 2-16: The wizard detects the driver information file.

6. The wizard will complete the driver installation as shown in figure 2-17. Click *Finish* to exit the wizard.
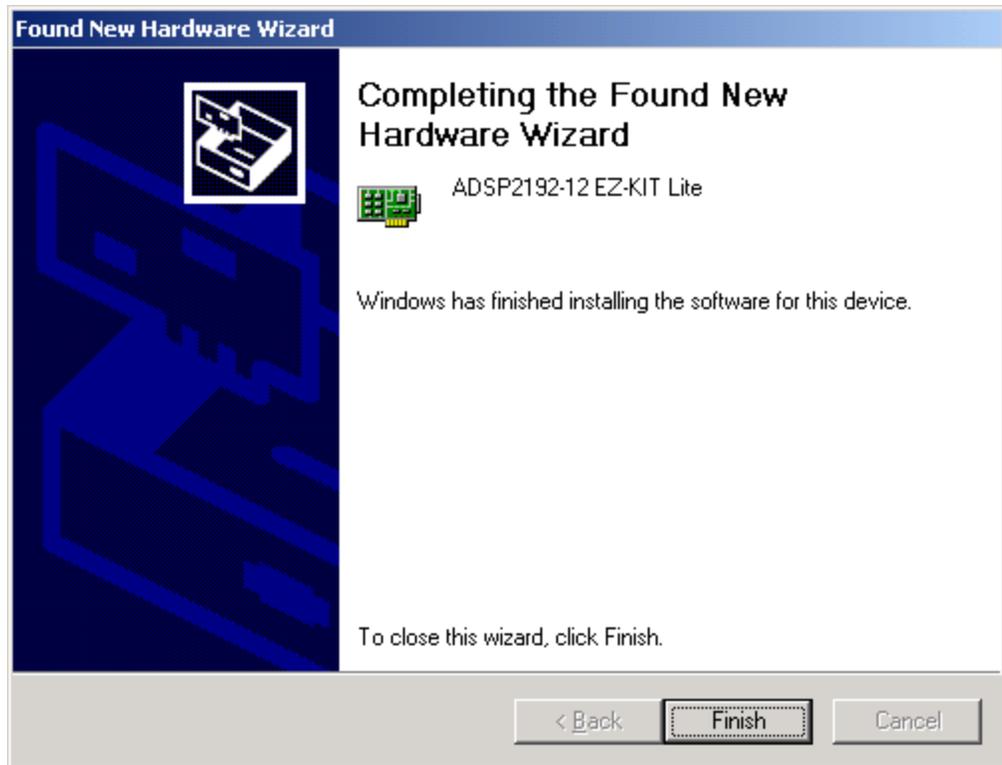
Figure 2-17: The driver has been successfully installed.

7. Reboot the system before attempting to run the debugger over the PCI interface.

2.5.2.2 Installing VisualDSP

This EZ-KIT Lite comes with the latest evaluation version of VisualDSP for the ADSP-219x Family DSPs. You must install this software prior to installing the EZ-KIT Lite software. Insert the VisualDSP CD into the CD-ROM drive. This will bring up the CD browser. Click on the "Install VisualDSP" option. This will launch the setup wizard. Follow this wizard with the on-screen instructions.

2.5.2.3 Installing the EZ-KIT Lite License Software

Before the VisualDSP software can be used, the license software must be installed. To install the EZ-KIT Lite license software, follow these steps:

1. Make sure VisualDSP has been installed first.
2. Insert the VisualDSP CD into the CD-ROM drive if it is not already in the drive.
3. Once the CD browser is on the screen select the "Install License" option.
4. Now follow the setup wizard instructions. (Note: Make sure that you have the proper serial number located on the back of the CD holder.)

2.5.2.4 Installing EZ-KIT Lite Debug Software

The EZ-KIT Lite software is supplied on a separate CD-ROM. To install the EZ-KIT Lite software, follow these steps:

1. Make sure VisualDSP has been installed first.
2. Close all Windows applications. The install will not work correctly if any VisualDSP applications are running.
3. Insert the EZ-KIT Lite CD into the CD-ROM drive. The setup will automatically start. Follow the installation wizard by choosing the appropriate options.
4. When the setup has completed reboot the machine.

3   USING EZ-KIT LITE SOFTWARE

3.1 Overview

The EZ-KIT Lite software contains the files necessary to perform debugging over the PCI bus. Additionally, monitor source code and example programs are provided for use with the EZ-KIT Lite.

The monitor software is a small debug kernel that is loaded onto each core of the ADSP2192-12 when the VisualDSP debugger is started. The monitor enables VisualDSP running on a host PC to communicate with the DSP over the PCI interface. This allows the user the ability to read/write registers, read/write memory, view hardware stacks, run, halt, step and set breakpoints among other debug activities. Understanding how the monitor works and its limitations are essential for proper operation of the EZ-KIT Lite when used with VisualDSP over the PCI interface. This chapter will provide information on how the monitor works and how to use the EZ-KIT Lite and VisualDSP to debug custom programs. Note that references to the monitor are only relevant when using the PCI interface, not the optional JTAG interface to the EZ-KIT Lite.

3.2 Monitor Program Operation

As mentioned previously, the monitor is loaded onto each core when the VisualDSP debugger is first started. The monitor performs the necessary functions in order to perform debugging activities through the VisualDSP debugger such as reading/writing registers, reading/writing memory, viewing hardware stacks, running, halting, stepping and setting breakpoints.

In order to carry out these functions, the monitor must use resources on the DSP such as memory and interrupts and set some restrictions upon what the user may do in their code. All of the monitor resources and restrictions are discussed below.

Aside from the resources and restrictions the monitor runs transparently to the user. From the user's point of view they will see each core in either a running or halted state. While the core is running it is executing user code and while the core is halted it is really running monitor code. While in the halted state VisualDSP can request information from the monitor such as register and memory values.

The source code for the monitor is included with the EZ-KIT Lite setup. The user may find the sources helpful in understanding the operation of the monitor and of the ADSP2192-12.

3.2.1 Monitor Resources and Restrictions

This section will describe in detail what resources are used and what restrictions are set by the EZ-KIT Lite. It is important that the user does not tamper with the resources claimed by the monitor and that the user follow the specified restrictions when using the VisualDSP debugger and PCI interface with the EZ-KIT Lite.

3.2.1.1 Resources

The monitor uses two interrupts and small blocks of data and program memory on each core. These resources are therefore not available to user programs.

The two interrupts used by the monitor are:

- Kernel interrupt (bit 2 in IMASK)
- Mailbox interrupt (bit 4 in IMASK)

The memory ranges used by the monitor are:

- 0x7800 - 0x7FFF (16 bit Data Memory)
- 0x10008 - 0x1000B (kernel interrupt vector)
- 0x10010 - 0x10013 (mailbox interrupt vector)
- 0x13A00 - 0x13FFF (24 bit Program Memory)

The debugger will catch any attempts by the user to over write the reserved regions of memory if a write is attempted with a debugger command such as a load or fill. It cannot stop user code from overwriting these regions though.

After a program is loaded the interrupt vectors used by the monitor are automatically filled so that users do not need to include these vectors in their source code.

3.2.1.2 Restrictions

The following restrictions should be followed to ensure proper operation of the monitor:

- Only one ADSP2192-12 EZ-KIT Lite may be plugged into the PC at one time. Plugging more than one EZ-KIT Lite in at one time may cause unpredictable behavior.
- Do not press the reset button on the EZ-KIT Lite with the debugger open. See the section below for more information on hard reset. Pressing this button will reset the DSP and cause it to lose communication with the PCI interface on the PC. You can reset each core through the *Reset* command in the Debugger if necessary. This will reset the core without resetting the PCI configuration of the DSP.
- Disabling global interrupts will cause VisualDSP to lose all communication with the monitor. Executing the "*DIS INTS;*" instruction will disable global interrupts on the core. If user code executes this instruction while running, it must enable global interrupts with the "*ENA INTS;*" instruction in order for VisualDSP to regain communication. It is recommended that user code does not disable global interrupts.
- Disabling the kernel interrupt will cause VisualDSP to lose some communication with the monitor. Clearing bit 2 in the IMASK register will disable this interrupt. While disabled the user will not be able to single-step or use software breakpoints. It is recommended that user code does not disable kernel interrupts.
- Disabling the mailbox interrupt will cause VisualDSP to lose some communication with the monitor. Clearing bit 4 in the IMASK register will disable this interrupt. While disabled the user will not be able to halt the core. It is recommended that user code does not disable mailbox interrupts.

- Disabling interrupt nesting will cause VisualDSP to lose communication with the monitor if the user code uses interrupts. Clearing bit 4 in the ICNTL register will disable interrupt nesting. It is recommended that the user does not disable nesting if they intend to use interrupts in their code.
- Do not push more than 30 values onto the PC stack. This stack is used for temporary storage upon entering the monitor. It is highly unlikely that user code will ever need more than 30 stack locations but pay closer attention when debugging C programs as the PC stack may grow without your knowledge due to function calls and library routines.

Pressing the reset button on the board will reset the DSP including its PCI configuration. **Do not press this with the debugger open or you will lose communication with the board**. If it is necessary to perform a power on reset the user can either power down the machine or close the debugger, hit the reset button, and reload the driver. Follow the instructions below to reload the driver:

For Windows 95/Windows 98
1. Right-click on My Computer and select Properties.
2. From the Device Manager tab double click DSP Emulators and highlight the ADSP2192-12 EZ-KIT Lite
3. Click Remove and then Ok to confirm it.
4. Click Refresh and Windows will detect the EZ-KIT Lite and bring up the hardware wizard. If necessary, follow the Wizard with the default values and it will find the proper driver from the previous install.
5. Once the Wizard is complete you may use the debugger again.

For Window 2000
1. Only users with administrator privileges can add and remove devices, contact the administrator if necessary.
2. Right-click on My Computer and select Properties.
3. From the Hardware tab click Device Manager tab
4. Double click DSP Emulators and highlight the ADSP2192-12 EZ-KIT Lite
5. Press the delete key and then Ok to confirm it
6. Click the "Scan for hardware changes" icon and Windows will detect the EZ-KIT Lite and bring up the hardware wizard.
7. When prompted for where to look select the WINNT\INF folder so that Windows will find the INF file from the original installation.
8. Once the Wizard is complete you may use the debugger again.

For Windows NT
1. Only users with administrator privileges can load the EZ-KIT Lite driver, contact the administrator if necessary.
2. From the Start menu go to Settings and choose Control Panel.
3. Double-click on Devices.
4. Scroll down to Wm2192Ez and highlight it. Click Stop and Yes to confirm it.
5. When it has stopped press Start to reload it.
6. Once started you may use the debugger again.

3.2.2 User Programs

This section will provide the user with information on creating programs that will operate properly with the EZ-KIT Lite. The user will use the VisualDSP ADSP-219x code generation tools (an evaluation version is shipped with this EZ-KIT Lite) to build DSP applications and debug them with the VisualDSP debugger (also shipped with this EZ-KIT Lite).

Although there are many ways to go about developing programs in the VisualDSP environment, most will include the following steps:

1. Create a new project.
2. Set target processor options.
3. Add and edit project files such as C, assembly, header, and linker description files.
4. Customize project build options such as output filenames, optimizations, etc.
5. Build a debug version of the project.
6. Debug the program with the debugger.
7. Build a release version of the project.

Refer to the VisualDSP manuals and on-line help for detailed descriptions on creating projects and the ADSP-2192 data sheets and manuals for information on programming the DSPs.

There are four example programs included with the EZ-KIT Lite. These are assembly and C programs designed to help the user build programs that will work properly with this EZ-KIT Lite and demonstrate some of its capabilities. A few things for a user to keep in mind when building projects for use with the PCI debugger interface are:

- A sample linker description file (.ldf) has been included with each example program. This file shows a possible memory allocation scheme that will not conflict with the monitor.
- A modified C run-time header file (2192_hdr.asm) has been included with each example C program. The code in this file performs some C initialization routines before arriving at *main()*. This code normally disables all interrupts but has been modified to enable the interrupts needed by the monitor (kernel and mailbox). **Users should include this file with new C projects that they develop for this EZ-KIT Lite, and not include the 219x_hdr.doj library in the linker description file.**

3.2.2.1 ADSP2192-12 EZ-KIT Lite Memory Map

The ADSP2192-12 EZ-KIT Lite memory map is shown in the table below. Note the ranges reserved by the monitor.

Memory Range	Core A	Core B
0x0000 0x3FFF	16 bit data memory (DM)	16 bit data memory (DM)
0x4000 0x77FF	16 bit data memory (DM)	16 bit data memory (DM)

Memory Range	Core A	Core B
0x7800 0x7FFF	Reserved for monitor	Reserved for monitor
0x8000 0xBFFF	16 bit data memory (DM)	Reserved
0xC000 0xFFFF	16 bit data memory (DM)	Reserved
0x10000 0x139FF	24 bit program memory (PM)	24 bit program memory (PM)
0x13A00 0x13FFF	Reserved for monitor	Reserved for monitor
0x14000 0x14FFF	24 bit program ROM	24 bit program ROM
0x15000 0x1FFFF	Reserved	Reserved
0x20000 0x20FFF	Shared memory	Shared memory

Table 3-1: ADSP2192-12 EZ-KIT Lite Memory Map

3.3 Connecting With the VisualDSP Debugger

In order to start debugging for the first time you must set up a session with the Debugger. To create a new session using the EZ-KIT Lite PCI interface follow these steps:

- Press and Hold down the Control (CTRL) key.

- Select the *Start* button on the Windows taskbar, then choose *Programs*, *VisualDSP*, *Debugger*.

- The *Session List* dialog will appear. Click on *New Session*…. (Release CTRL key)

- The *Target Selection* dialog will appear as shown in figure 3-1.

- Under the *Debug Target* menu choose *EZ-KIT Lite (ADSP2192-12)*. There is only one supported platform so you can leave the default selection in the *Platform* list.

- Give the target a name in the *Target Name* field or accept the default.

- Check both boxes in the *Multiprocessor System* list box.

- Click *OK* to return to the *Session List*, make sure the new session is highlighted, and click *Activate*.
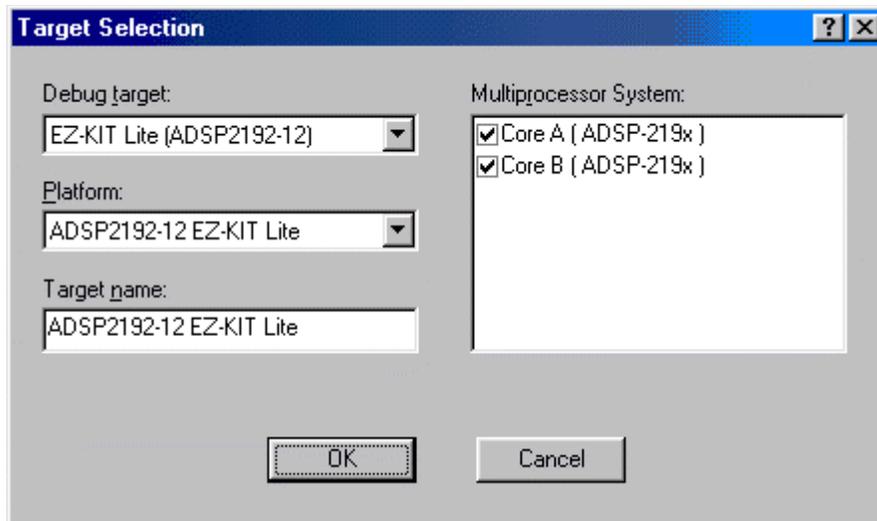
Figure 3-1: VisualDSP Debugger *Target Selection* dialog box.

3.4 Using VisualDSP

For information on operating VisualDSP, consult the On-line Help and Users manuals that are installed with VisualDSP software distribution.

3.5 Example Programs

The ADSP2192-12 EZ-KIT Lite is shipped with four complete example projects, Talkthru, Dual_FIR, MPTimers, and Primes. For more detailed information regarding these projects, and the expected output of the applications, see the accompanying .txt files that are located in each project directory. These project directories can be found in:

  \Program Files\Analog Devices\VisualDSP\219x\EZ-KITs\2192-12\Examples

4 WORKING WITH EZ-KIT LITE HARDWARE

4.1 Overview

This chapter discusses the hardware components on the ADSP2192-12 EZ-KIT Lite board. The following topics are covered:

- Power Supplies in Section 4.4

- Jumpers in Section 4.5

- Switches in Section 4.6

- LEDs in Section 4.7

- Serial EEPROM in Section 4.8

- JTAG Connector in Section 4.9

- Expansion Port Connector in Section 4.10

- Breadboard Area in Section 4.11

The EZ-KIT Lite bill of materials and schematics are available at the end of this manual in Appendix A and Appendix B, respectively.

4.2 System Architecture
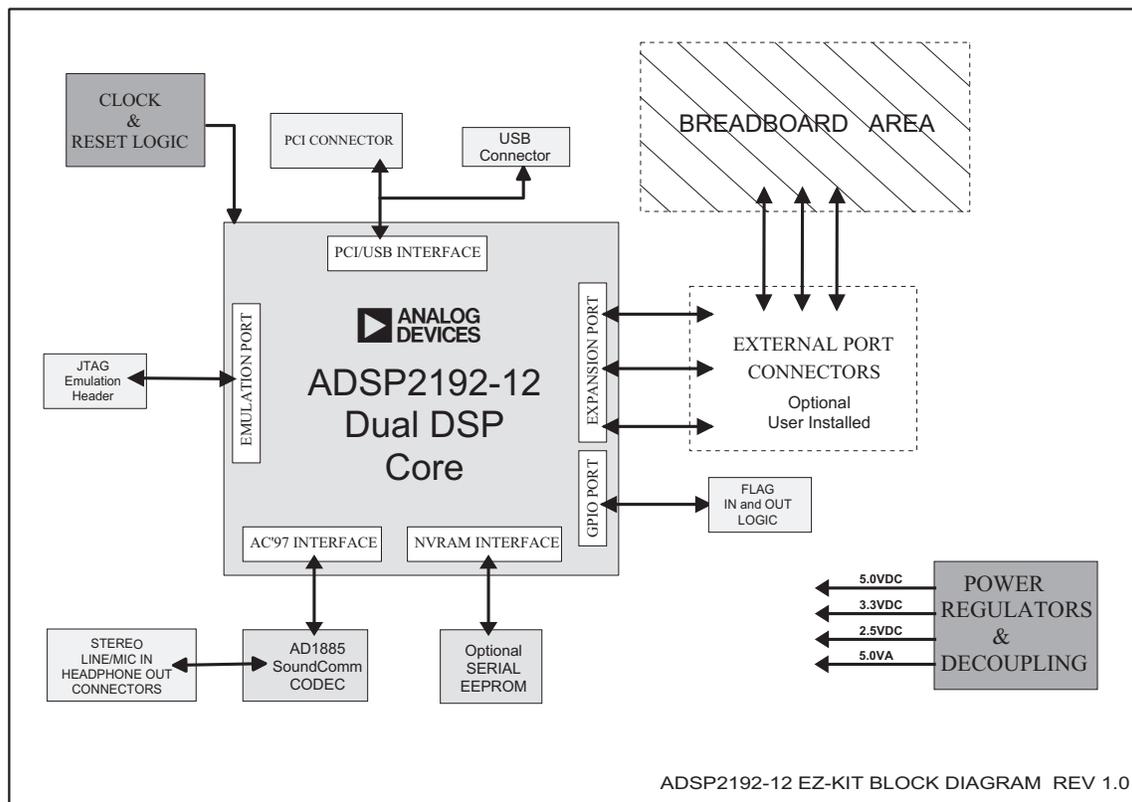
Figure 4-1: Block Diagram of ADSP2192-12 EZ-KIT Lite

4.3 Board Layout
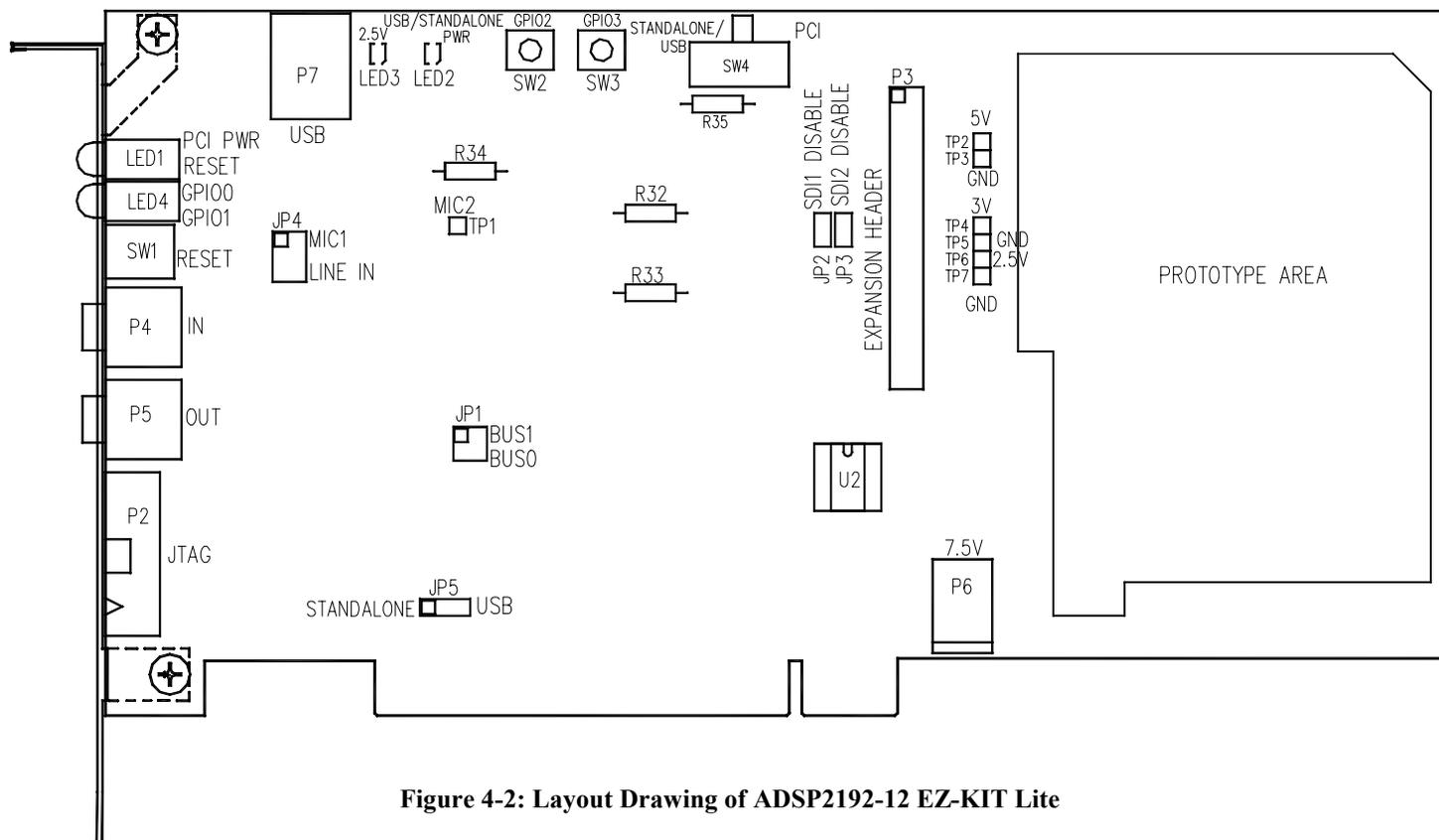
Figure 4-2: Layout Drawing of ADSP2192-12 EZ-KIT Lite

4.4 Power Supplies

In PCI mode the ADSP2192-12 EZ-KIT Lite uses the PCI bus to supply power to the board. The 5V, 3.3V, and the 2.5V are all derived from the PCI 5V pins. The +5V analog power for the AD1885 codec is derived from the +12V supply of the PCI Bus. This keeps the Analog and Digital powers isolated from one another.

In USB or Stand Alone mode the ADSP2192-12 EZ-KIT Lite uses the ADP3338 and the ADP3339 parts to regulate the 5V, 3.3V, and 2.5V digital power and +5V analog power required by the board. An external power supply, not provided in the EZ-KIT Lite, is required for USB mode or Stand Alone Mode. This power supply should not be used when using the EZ-KIT Lite via the PCI Interface. Below is a more detailed description of the power connector and power supply specifications.

4.4.1 Power Connector

The power connector supplies DC voltages to the EZ-KIT Lite board. Table 4-1 shows the power connector pin out.

Terminal	Connection
Center pin	+7.5-12 VDC@2amps
Outer Ring	GND

Table 4-1: Power Connector Pin-out

4.4.2 European Power Supply Specifications

Below is the description of the Power Supply that a user must provide if the EZ-KIT Lite is used in USB mode or Stand Alone mode.

DC VOLTAGE	7.5V +/- 5% (Full Load)
CURRENT	2 Amps (Maximum Rating)
RIPPLE	500 mV rms (Max @ Full Load)
DC CONNECTOR Type: Plug Size: Polarity:	Switchcraft 760 style, FEMALE 5.5 (OD) V 2.5 (ID) X 9.5 (length) millimeters Center is Positive (inside terminal)

Table 4-2: External Power Supply Specifications

4.5 Jumpers

4.5.1 Bus Mode Selection Jumpers (JP1)

The Bus Mode Jumpers (JP1) are used to configure the BUS [1:0] pins on the ADSP2192-12 DSP. In order to use the board in Stand Alone Mode the DSP must be placed in Sub-ISA mode.
Below are the different configurations for the BUS pins.

➢ *NOTE: This Jumper should be used in conjunction with JP5 and SW4 to properly setup the board.*
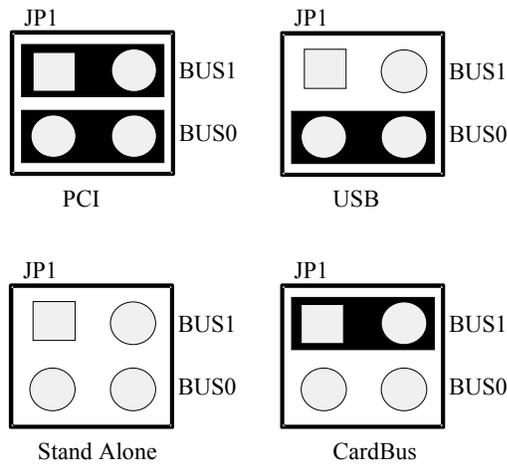
Figure 4-3: BUS Pin Settings (JP1)

BUS [1:0]	MODE	JP1 (Pin 1 and Pin 2)	JP1 (Pin 3 and Pin 4)
00	*PCI	IN	IN
01	CardBus (Unused)	IN	OUT
10	USB	OUT	IN
11	Sub-ISA Stand Alone	OUT	OUT

* Denotes Default setting.

Table 4-3: BUS Pin Settings (JP1)

For more information on the ADSP2192-12 DSP Bus pins, please refer to the ADSP2192-12 Datasheet.

4.5.2 USB / Stand Alone Selection Jumpers (JP5)

The USB / Stand Alone Jumper selection allows a user to choose between USB operation and Stand Alone operation. When in PCI mode and the switch SW4 is set accordingly, this jumper is disregarded. USB/stand alone operation are optional modes and is not supported by the supplied VisualDSP monitor based software.

➢ *NOTE: This Jumper should be used in conjunction with JP1 and SW4 to properly setup the board.*

JP5   JP5
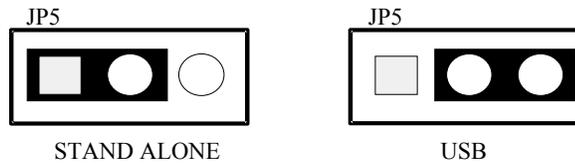
STAND ALONE   USB

Figure 4-4: USB/Stand Alone Selection (JP5)

MODE	JP5
*Stand Alone	Pins 1 and 2
USB	Pins 2 and 3
PCI	N/A

* Denotes Default setting.

Table 4-4: USB/Stand Alone Selection (JP5)

4.5.3 External AC'97 Disable Jumpers (JP2, JP3)

The external AC'97 Disable Jumpers (JP2 and JP3) are used to disable the SDI1 and SDI2 pins of the AC'97 interface in the ADSP2192-12 DSP. These pins are left disabled or grounded so that the respective pins on the ADSP2192-12 DSP are not left floating. If the board is using the SDI1 and SDI2 pins via the Expansion Connector, then the respective jumper should be uninstalled. The on-board AD1885 codec will not be affected in any way by these jumpers, since the AD1885 uses SDI0 as a means of communication with the ADSP2192-12 DSP.

MODE	SD1 (JP2)	SD2 (JP3)
*SDI Disable	Install	Install
SDI Enable	Uninstall	Uninstall

*Denotes Default setting.

Table 4-5: External AC'97 Settings (JP2, JP3)

4.5.4 Codec Line In / Microphone Jumpers (JP4)

The codec Line In/ Microphone Jumpers allow a user to choose between the AD1885 being connected to a Line In signal or a Microphone signal from the Audio Connector (P4). The audio connector has an "IN" label on the edge bracket. If Microphone is selected the AD1885 provides a built-in amplifier with 20dB of gain. For more details on the AD1885 codec, please refer to the AD1885 datasheet.

MIC IN   LINE IN
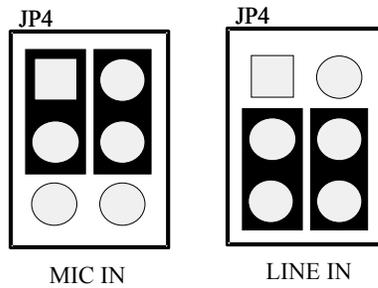
Figure 4-5: Line In / Mic Settings (JP4)

MODE	JP4
MIC	Connect Pins 1 & 3 and 2 & 4
*LINE IN	Connect Pins 3 & 5 and 4 & 6

*Denotes Default setting.

Table 4-6: Line In / Mic Settings (JP4)

4.5.5 JTAG Jumpers (P2)

The JTAG Header (P2), located on the edge, should have jumpers installed when an Analog Devices JTAG emulator is not being used. This holds the JTAG signals in the correct state to allow the DSP to run free.

Remove all the jumpers when connecting the emulator to the JTAG header. Below is a more detailed description of the jumper setting required to set the board to the correct configuration.
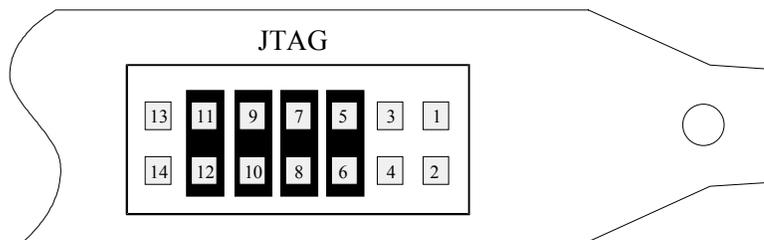
Figure 4-6: JTAG Default Jumper Settings

4.6 Switches
4.6.1 Reset (SW1)

The RESET switch (SW1) located on the edge bracket should be used only if manual intervention is required for the ADSP2192-12. This switch is connected to the PORST~ signal of the DSP and causes the DSP to restart by re-executing from the internal ROM. The use of this switch is primarily intended when in Stand Alone mode. For more information on the different modes please refer to section 4.6.3 "Communication Modes."

> ➢ *NOTE: If this switch is asserted while using the EZ-KIT Lite in PCI mode, communication to the Monitor program will be lost. This is because the DSP will restart by executing from the internal ROM. This will in effect cause the ADSP2192-12 to re-negotiate with the PCI bus.*

A user can perform an ADSP2192-12 DSP chip reset using the Monitor program provided. This allows the user to reset the DSP without losing any PCI communication. Please refer to software section (Section 3) of this manual for more details.

4.6.2 GPIO Interrupts (SW2, SW3)

The GPIO2 (SW2) and GPIO3 (SW3) are located at the top, center of the EZ-KIT Lite board. They allow a user to send a manual push button interrupt to the ADSP2192-12 DSP. If the push buttons are asserted, the respective GPIO2 and GPIO3 signals go from a logic '1' (high) to a logic "0" (low).

4.6.3 Communication Mode (SW4)

The Communication Mode switch (SW4), located at the top center of the EZ-KIT Lite board, is used to choose between PCI, USB, or Stand Alone operation. The switch also allows the circuitry on the board to either be powered by the PCI BUS or a user provided external power supply. The external power supply is required for both the USB and the Stand Alone operation. For more information on the power supply requirements please refer to section 4.4 of this manual.

MODE	SW4 Position	Actual SW4 Pin Connection
*PCI	Right	Pin 2 => Pin 1 Pin 5 => Pin 4 Pin 8 => Pin 7 Pin 11 => Pin 10
Stand Alone	Left	Pin 2 => Pin 3 Pin 5 => Pin 6 Pin 8 => Pin 9 Pin 11 => Pin 12
USB	Left	Pin 2 => Pin 3 Pin 5 => Pin 6 Pin 8 => Pin 9 Pin 11 => Pin 12

* Denotes Default setting.

Table 4-7: Communication Mode Switch Settings
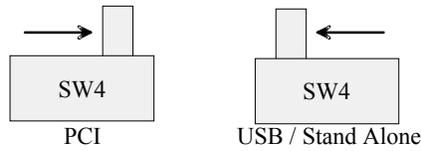
Figure 4-7: Communication Mode Switch Settings

> ➤ *NOTE: In order to properly setup the board this switch should be configured in conjunction with configuring JP1 and JP5. For more information on jumper setting please see section 4.5 of this manual.*

4.7 LEDs

The ADSP2192-12 EZ-KIT Lite has a total of six LEDs for power indication, reset indication, and GPIO flag indication. The following is a more detailed description of the functionality of each respective LED.

- LED1 is a dual light emitting diode package. The red light emitting diode indicates the pushbutton reset is depressed and the RESET~ is asserted. The green light emitting diode indicates the PCI bus is powering the board and SW4 is set to the right position signifying PCI operation.

- LED2 is a green light emitting diode, which indicates the board is being powered by a user provided external power supply and SW4 is set to the left position signifying Standalone or USB operation.

- LED3 is a green light emitting diode, which indicates the EZ-KIT Lite has power and ADSP2192-12 DSP core is being powered by 2.5V.

- LED4 is a dual light emitting diode package. Both LEDs are yellow and indicate status of the GPIO1 and GPIO0 lines of the ADSP2192-12 processor.

4.8 Serial EEPROM

The ADSP2192-12 EZ-Kit Lite provides socketed pins (U2) for an optional Serial EEPROM. The EEPROM is not required for operation of the board. It is only necessary if a customer wishes to modify the internal ROM code of the ADSP2192-12. If a customer wishes to install an EEPROM, then he or she can use one of the following devices or one that is electrically similar:

Manufacturer:	Part Number:	Description:
Fairchild Semiconductor	NM93C56N	2 K-Bit 5Volt "MicroWire" Serial EEPROM
Microchip	93C56BP	2 K-Bit 5Volt "MicroWire" Serial EEPROM

Table 4-8: Suggested Serial EEPROMs

4.9 JTAG Connector

The JTAG Interface allows a user to access the ADSP2192-12 DSP via the Emulation Port. Using an optional Analog Devices Emulator and optional software a user can run, test, and debug their code in any of the three modes: PCI, USB, or Stand Alone. For more information on the different types of emulator's available please refer to: http://www.analog.com/industry/dsp/tools/selection.html

The JTAG header (Figure 4-8) is the connecting point for the JTAG in-circuit emulator pod. Note that one pin is missing (pin 3) to provide keying. The mating connector should have a plug inserted in the Pin 3 location.
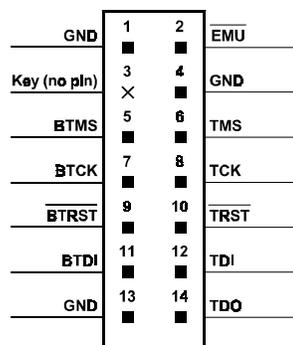
Figure 4-8: JTAG Header Pinout

> ➢ *NOTE: Power should be applied to the JTAG pod before connecting it to the EZ-KIT Lite board.*

For more information regarding the JTAG Interface, please refer to the Analog Devices JTAG Technical Reference:
http://www.analog.com/techsupt/application_notes/EE_notes/pdf_files/ee_68.pdf

4.10 Expansion Port Connector

The expansion port connector provides access to the ADSP2192-12 DSP GPIO and AC'97 signals. A user can connect up to two additional AC'97 devices using this connector and breadboard area.

> ➢ WARNING: External port loading can effect bus speed and performance.

Pin Number	Name	Pin Number	Name
1	Digital GND	19	Digital GND
2	Digital GND	20	Digital GND
3	ACRST~	21	GPIO7
4	Digital GND	22	Digital GND
5	SYNC	23	GPIO6
6	Digital GND	24	Digital GND
7	SDO	25	GPIO5
8	Digital GND	26	Digital GND
9	SDI2	27	GPIO4
10	Digital GND	28	Digital GND
11	SDI1	29	GPIO3
12	Digital GND	30	Digital GND
13	SDI0	31	GPIO2
14	Digital GND	32	Digital GND
15	Digital GND	33	GPIO1
16	Digital GND	34	Digital GND
17	BITCLK	35	GPIO0
18	Digital GND	36	Digital GND

Table 4-9: Expansion Connector Pinout

4.11 Breadboard Area

The ADSP2192-12 EZ-KIT Lite has a 2.5"x3.5" breadboard area allowing a user to add additional thru hole or SMT components on the board. Applications could include adding more LEDs or switches to the unused GPIO Pins in the Expansion Connector, or connecting other AC'97 compliant devices to the ADSP2192-12.

➢ WARNING: Adding additional hardware could cause the board to malfunction. If additional devices are used, while in USB or Stand Alone modes, it is suggested power be supplied to them externally.

APPENDIX A: BILL OF MATERIALS

Item #	QTY	Description	Reference Designators	Manufacturer/Distributor	Part Number
1	4	0.00 1/4W 5% RC05	R32-35	DIGI-KEY / YAGEO	0.0QBK-ND
				DIGI-KEY / YAGEO	0.0QTR-ND
2	2	74LVC14A SOIC14	U4-5	TI	74LVC14AD
				PHILIPS	74LVC14AD
3	1	24.576MHZ SMT OSC005	Y1	EPSON	MA505 24.576M-C2
				DIGI-KEY	SE2538CT-ND
4	1	IDC 7X2 IDC7X2	P2	SAMTEC	TST-107-04-S-D-RA
5	23	0.01uF 100V 10% 1206	C31,C33,C35,	AVX	12061C103KAT050M
			C38,C40,C42,	AVX	12061C103KAT1A
			C57-68,C73-77	AVX	12061C103KAT2A
				AVX	12061C103KATATMA
				AVX	12061C103KATMA
				MUR	GRM42-6X7R103K100BD
6	2	1000pF 50V 5% 1206	C20,C21	AVX	12065A102JAT2A
				AVX	12065A102JATMA
				KEMET	C1206C102J5GAC
7	42	0.1uF 50V 10% 1206	C13,	PHILIPS	12062R104K9BB2
			C17-19,C22-30,	AVX	12065C104KAT1A
			C32,C34,C36-	AVX	12065C104KAT2A
			37,C39,C41,	AVX	12065C104KATMA
			C43-56,C69-72,	AVX	12065C104KATRE
			C78-82	KEMET	C1206C104K5RAC
				MUR	GRM42-6X7R104K050BD
8	1	ADM708SAR SOIC8	U6	ANALOG	ADM708SAR
9	1	AD1885JST LQFP48	U3	ADI	AD1885JST
10	1	ADSP-2192-12 LQFP144	U1	ADI	ADSP2192-12MKST160
11	1	ADP3338AKC-33 SOT-223	VR2	ANALOG	ADP3338AKC-3.3
12	1	ADP3338AKC-5 SOT-223	VR4	ANALOG	ADP3338AKC-5
13	1	ADP3338AKC-25 SOT-223	VR3	ANALOG	ADP3338AKC-2.5
14	1	ADP3339AKC-5 SOT-223	VR1	ANALOG	ADP3339AKC-5-REEL
15	1	PWR 2.5MM_JACK CON005	P6	SWITCHCRAFT	SC1152-ND12
				SWITCHCRAFT	SWC RAPC712
16	1	USB 4PIN CON009	P7	DIGI-KEY	897-30-004-90-000000
				MILL-MAX	ED90003-ND
17	1	4P2T SWT011	SW4	DIGI-KEY	EG1914-ND
				E-SWITCH	EG4208
18	1	8 PIN DIP TH-TH	U2	MILL-MAX	614-93-308-31-007
19	1	MOMENTARY SWT010	SW1	C&K	TP11-SH-A-B-E
20	2	3.5MM STEREO CON001	P4,P5	VEN. SHO00	SJ-0359AM-5
21	3	0.00 1/8W 5% 1206	R7,R38-39	DIGI-KEY	0.0ECT-ND
				DIGI-KEY	0.0ETR-ND
				YAGEO	P0.0ETR
				YAGEO	P0.0ETR-ND
22	2.000000	220uF 10V 20% E	CT5-6	CORNELL DUBILIR	AVS227M10E16T

				AVX	TAJE227M010R
23	2	22pF 50V 5% 805	C1-2	AVX	08055A220JAT
				MURATA	GRM40COG220J050AD
				MURATA	GRM40COG220J050AL
24	3	4.7K 100MW 5% 805	R2-4	AVX	CR21-4701F-T
				AVX	CR21-472J-T
				DALE	CRCW0805-472JTR
25	1	120 1/8W 5% 1206	R17	AVX	CR32-121JTR
				DALE	CRCW1206-121JRT1
				DALE	CRCW1206-523FTR1
26	2	1.8K 1/8W 5% 1206	R20-21	AVX	CR32-182J-T
27	1	2.21K 1/8W 1% 1206	R6	AVX	CR32-2211F-T
				ROHM	MCR18EZHF2211
28	2	2.2uF 35V 10% B	CT10,CT11	AVX	TAJB225K035R
29	7	10uF 16V 10% B	CT7,CT18-23	AVX	TAJB106K016R
30	1	1000 100MHZ 1.5A FER002	FER5	MURATA	PLM250S40T1
31	2	2A S2A_RECT DO-214AA	D1-2	GENERALSEMI	S2A
				MICROSEMI	S2A
32	7	600 100MHZ 500MA 1206	FER1-4,FER6-8	DIGI-KEY	240-1019-1-ND
				DIGI-KEY	240-1019-2-ND
				STEWARD	HZ1206B601R
33	1	0.047UF 16V 10% 1206	C16	AVX	1206YC473KAT05
				AVX	1206YC473KAT2A
				DIGI-KEY	PCF1042CT-ND
				DIGI-KEY	PCF1084CT-ND
34	1	1.50K 1/8W 1% 1206	R37	DALE	CRCW12061501FRT1
				DIGI-KEY	P1.50KFCT-ND
				DIGI-KEY	P1.50KFTR-ND
35	1	YELLOW LED006	LED4	DIALIGHT	552-0933
				IDI CHICAGO	5670H7LC
				BIVAR OPTO	H278CYDL
				LUMEX	SSF-LXH250LYYD
36	1	RED/GREEN LED006	LED1	DIALIGHT	552-0711
				BIVAR	H278CBC
				LUMEX	SSF-LXH250IGIGW
37	2	270PF 50V 10% 805	C14-15	KEMET	C1206C271K5GACTR
38	1	75 1/8W 5% 1206	R19	PHILIPS	9C12063A75R0JLRT/R
39	4	470PF 100V 10% 1206	C8-11	AVX	12061A471KAT2A
40	1	47PF 100V 10% 1206	C7	KEMET	C1206C470K1GACTU
				KEMET	C206C470K1GACTU
41	1	47.5 1/8W 1% 1206	R5	DALE	CRCW120647R5FRT1
				DALE	CRCW120647R5FTR1
42	14	10K 1/8W 5% 1206	R1,R12-15,R22-26,	DALE	CRCW1206-103JRT1
			R28,R30,R36,R40	KOA	RM73B2BT103JJRT1
43	1	100K 1/8W 5% 1206	R31	DALE	CR1206-1003JTR
44	4	4.7K 1/8W 5% 1206	R8-11	AVX	CR32-472J-T
				DALE	CRCW1206472JRT1
				ROHM	MCR18EZHMJW472
45	2	680 1/8W 5% 1206	R16,R18	AVX	CR32-681J-T

				DALE	CRCW1206-681JRT1
				KOA	RM73B2BT681J
46	2	100 1/4W 5% 1210	R27,R29	PANASONIC	ERJ-14YJ101
				PANASONIC	ERJ-14YJ101U
				DIGI-KEY	P100VCT-ND
47	2	GREEN-SMT LED001	LED2-3	PANASONIC	LN1361C
				DIGI-KEY	P504CT-ND
				DIGI-KEY	P504TR-ND
48	2	SPST_MOMENTARY SWT005	SW2-3	PANASONIC	EVQ-QS205K
49	10	1uF 25V 20% A	CT3-4,CT8,CT9,CT12-17	PANASONIC	ECS-T1EY105R
				AVX	TAJA105K020R
				AVX	TAJA105K025R
				AVX	TAJA105K035R
50	1	0.22uF 35V 20% A	CT2	DIGI-KEY	PCT6224CT-ND
51	1	QS3257Q QSOP16	U7	FAIRCHILD SEMI	FST3257QSC
				QUALITY SEMICON	QS3257Q
52	2	IDC 2X1 IDC2X1	JP2-3	DIGI-KEY	S1011-02-ND
53	1	IDC 3X1 IDC3X1	JP5	SULLINS	S1012-03
				SULLINS	PTC03SAAN
54	1	IDC 2X2 IDC2X2	JP1	SULLINS	PTC02DAAN
				DIGI KEY	S2012-02
55	1	IDC 3X2 IDC3X2	JP4	SULLINS	PTC03DAANR
				DIGI KEY	S2012-03-ND
56	1	2.5A RESETABLE FUS001	F1	RAYCHEM CORP.	SMD250-2
				DIGI KEY	SMD250CT-ND
NOTE: DO NOT POPULATE P1,P3,TP1-7 & C12					

APPENDIX B:SCHEMATICS

ADSP2192-12 EZ-KIT LITE

ANALOG DEVICES

20 Cotton Road
Nashua, NH 03063
PH:(603)-883-2430 FAX:(603)-882-2655

Approvals	Date	Title· ADSP2192-12 EZ-KIT LITE - TITLE SHEET		
Drawn	10/13/00			
Checked		Size B	Board No. A0159-2000	Rev 1.1
Engineering		Date 10-13-2000_17:10	Sheet 1 OF 8	

REVISIONS

REV	ECO	DESCRIPTION	ENGR	DATE	APPR
1.0		New Release		07/18/00	
1.1		REFER TO ECO2000-098		10/06/00	

5V

12V   PCI5V   PCIVAUX   PCI3V

PCI3V   PCI5V

TABLE FOR BUS MODE PINS

BUS[1:0]	MODE	SJ1	SJ2
00	PCI	IN	IN
01	CardBus	IN	OUT
10	USB	OUT	IN
11	Sub-ISA (Stand Alone)	OUT	OUT

U1

ADSP2192-12

ADSP-2192-12
LQFP144

P1

PCI CONNECTOR

PCI32B

AD[31:0]

Y1
24.576MHZ
OSC005

CRYSTAL

C1
22PF
805

C2
22PF
805

JP1

IDC2X2
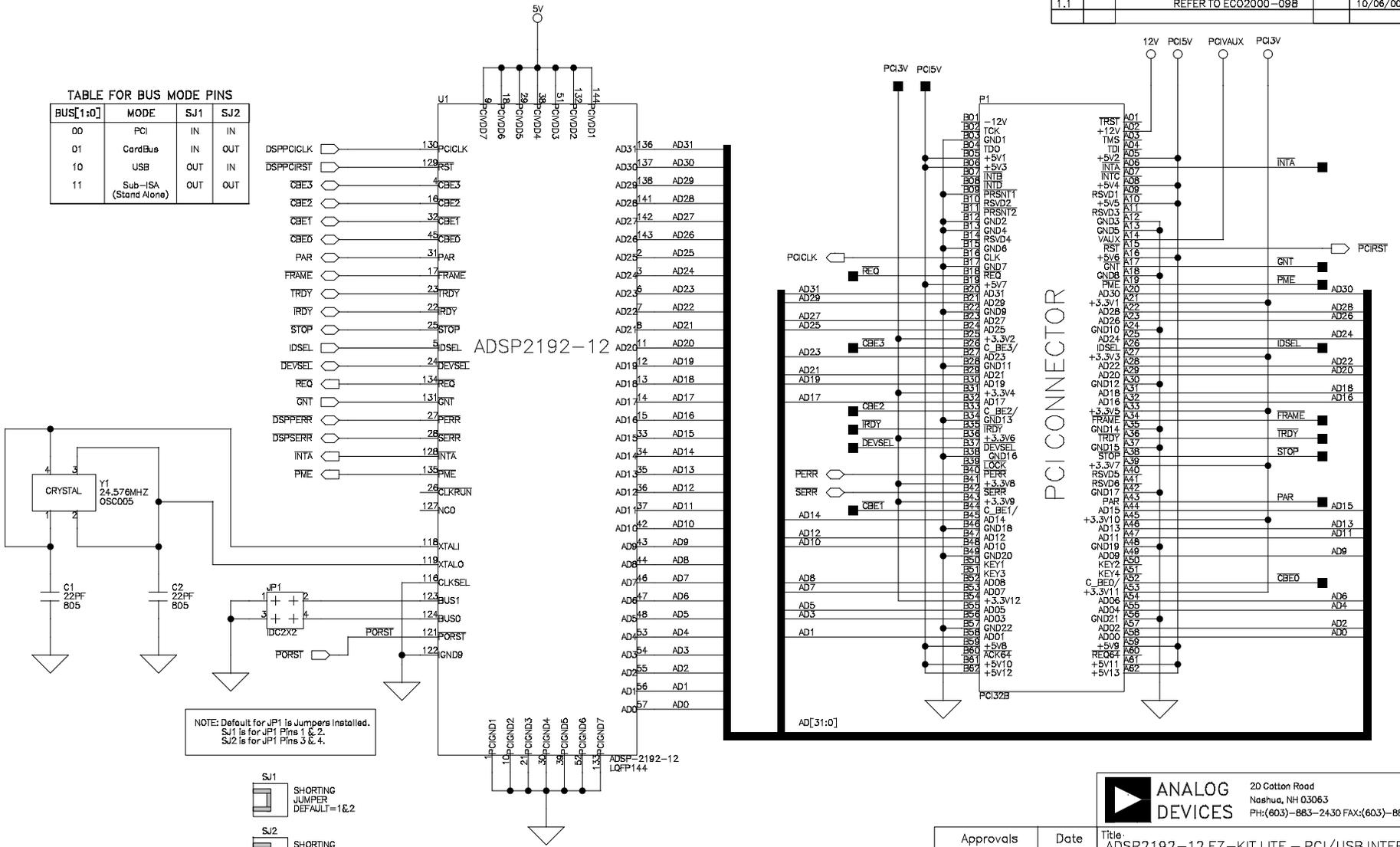
NOTE: Default for JP1 is Jumpers Installed.
SJ1 is for JP1 Pins 1 & 2.
SJ2 is for JP1 Pins 3 & 4.
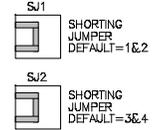
SJ1
SHORTING
JUMPER
DEFAULT 1&2

SJ2
SHORTING
JUMPER
DEFAULT 3&4

DSPPCICLK   PCICLK
DSPPCIRST   RST
CBE3   CBE3
CBE2   CBE2
CBE1   CBE1
CBE0   CBE0
PAR   PAR
FRAME   FRAME
TRDY   TRDY
IRDY   IRDY
STOP   STOP
IDSEL   IDSEL
DEVSEL   DEVSEL
REQ   REQ
GNT   GNT
DSPPERR   PERR
DSPSERR   SERR
INTA   INTA
PME   PME
CLKRUN
NC0
XTALI
XTALO
CLKSEL
BUS1
BUS0
PORST
GND9

PCICLK
REQ
CBE3
CBE2
IRDY
DEVSEL
PERR
SERR
CBE1

PERR
SERR

INTA
PCIRST
GNT
PME
IDSEL
FRAME
TRDY
STOP
PAR
CBE0

Approvals	Date
Drawn	10/13/00
Checked	
Engineering	

Title: ADSP2192-12 EZ-KIT LITE - PCI/USB INTERFACE

Size B   Board No.   A0159-2000   Rev 1.1

Date 10-19-2000_12:02   Sheet 2 OF 8

REV	ECO	DESCRIPTION	ENGR	DATE	APPR
1.0		New Release		07/18/00	
1.1		REFER TO ECO2000-098		10/06/00	

REVISIONS

5V

R1
10K
1206

U2
DI 3
MicroWire
Serial EEPROM
SK 2
CS 1
DO 4
NM93C56N
DIP8SOC

NOTE: Serial EEPROM sits on socketed pins.

2.5V V_SELECT1 5V

2.5V

3V V_SELECT2

3V

R2 4.7K 805   R3 4.7K 805   R4 4.7K 805

NOTE: Place JTAG Connector on Edge Bracket.

NOTE: Place Expansion Connector next to Bread Board Area.

U1

140 VDD8
125 VDD7
117 VDD6
103 VDD5
58 VDD4
49 VDD3
40 VDD2
19 VDD1

71 SDA
72 SCK
73 SEN

64 RVDD
60 RVAUX
63 CTRLVDD
61 CTRLAUX
62 VDD9

ADSP2192-12

65 AVDD
67 AGND
68 AQGND

69 NC1
66 NC2
70 NC3

94 NC4
95 NC5
115 NC6
114 NC7
106 NC8
107 NC9
109 NC10
105 NC11
108 NC12
110 NC13
112 ACVDD2
113 ACVAUX2
111 GND

ADSP-2192-12
LQFP144

V_SELECT2 3V

EMU 74
TMS 75
TCK 78
TRST 79
TDI 80
TDO 81

ACRST 102
SYNC 101
SDO 100
SDI2 97
SDI1 98
SDI0 99
BITCLK 96
ACVDD1 93
ACVAUX1 92

IO7 90
IO6 89
IO5 88
IO4 87
IO3 86
IO2 84
IO1 83
IO0 82

IOVDD2 85
IOVDD1 77
AIOGND2 91
AIOGND1 76

GND1 20
GND2 41
GND3 50
GND4 59
GND5 104
GND6 120
GND7 126
GND8 139

P2
IDC7X2

ACRST
SYNC
SDO
SDI2
SDI1
SDI0

R5
47
1206
BITCLK
C7
47PF
1206

BITCLK

GPIO7
GPIO6
GPIO5
GPIO4
GPIO3
GPIO2
GPIO1
GPIO0

JP2
IDC2X1

SJ3
SHORTING JUMPER
DEFAULT=INSTALLED

JP3
IDC2X1

SJ4
SHORTING JUMPER
DEFAULT=INSTALLED

P3
ACRST 3 4
SYNC 5 6
SDO 7 8
SDI2 9 10
SDI1 11 12
SDI0 13 14
15 16
BITCLK 17 18
19 20
GPIO7 21 22
GPIO6 23 24
GPIO5 25 26
GPIO4 27 28
GPIO3 29 30
GPIO2 31 32
GPIO1 33 34
GPIO0 35 36
IDC18X2

NOTE: JP2 and JP3 are used to short SDI1 and SDI2 to GND when not being used. This is done so that they are not floating inputs.

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Approvals	Date
Drawn	10/13/00
Checked	
Engineering	

Title: ADSP2192-12 EZ-KIT LITE – PERIPHERAL INTER

Size B   Board No. A0159-2000   Rev 1.1

Date 10-16-2000_11:21   Sheet 3 OF 8

ADSP2192-12 EZ-KIT LITE – CODEC

NOTE: Place PCI5V (PCI Power) and PORST LEDs on Edge Bracket.

NOTE: Place VCC LED Next to USB or Standalone position of Switch.

NOTE: Place GPIO0 and GPIO1 LEDs on top center of PCB.

NOTE: Place GPIO2 and GPIO3 switches on top center of PCB.

NOTE: Place Pushbutton Reset on Edge Bracket.

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Approvals	Date	Title: ADSP2192-12 EZ-KIT LITE - MISC.		
Drawn	10/13/00			
Checked		Size B	Board No. A0159-2000	Rev 1.1
Engineering		Date 10-13-2000_15:04	Sheet 5 OF 8	

NOTE: Place Caps next to Input and Outputs pins of Regulators
(VR1, VR2 and VR3) as close to their respective pins as possible.

PS
12V
VCC

F1
2.5A
FUS001

FER5
CHOKE_COIL
FER002

D2
2A
DO-214AA

VR1
3 INPUT   OUTPUT 2
GND
1 ADP3339AKC-5
SOT-223

P6
7.5V
CON005

C21
1000PF
1206

D1
2A
DO-214AA

R31
100K
1206

CT10
2.2UF
B

C22
0.1UF
1206

CT11
2.2UF
B

C23
0.1UF
1206
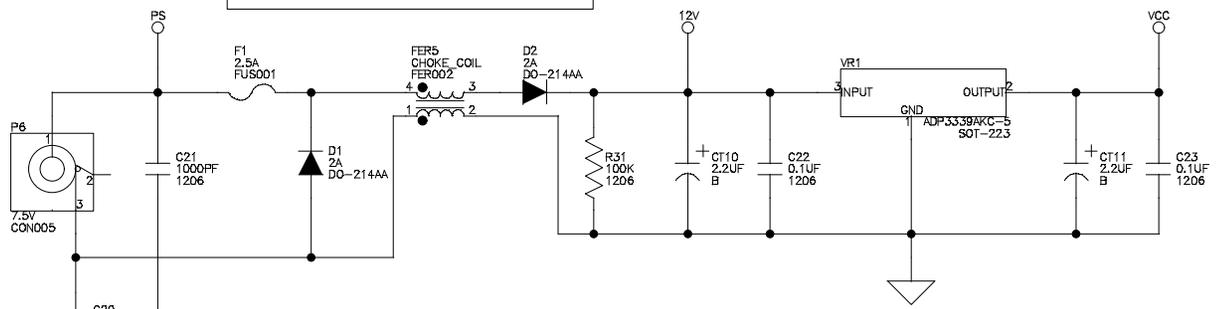
NOTE: R32, R33, and R34 are Zero Ohms Resistors.
They can be used to for current measurement
in each of their respective planes.

C20
1000PF
1206

SHGND

5V
3V
AVCC

VR2
3 INPUT   OUTPUT 2
GND
1 ADP333BAKC-33
SOT-223

R32
0.00
RC05

12V

VR4
3 INPUT   OUTPUT 2
GND
1 ADP333BAKC-5
SOT-223

R34
0.00
RC05

CT12
1UF
A

C24
0.1UF
1206

CT13
1UF
A

C25
0.1UF
1206

CT16
1UF
A

C28
0.1UF
1206

CT17
1UF
A

C29
0.1UF
1206

AGND
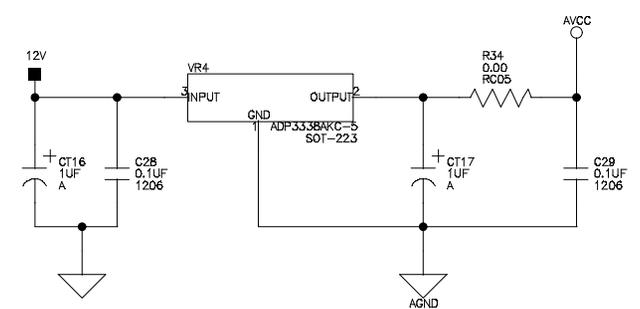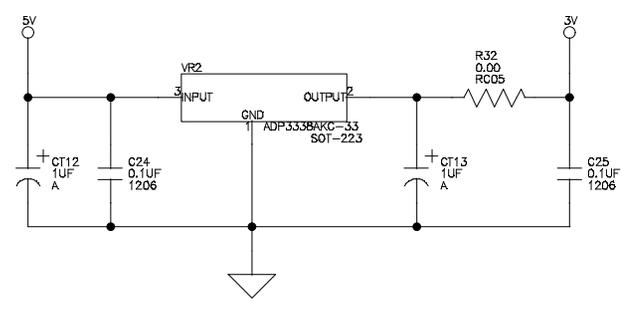
NOTE: Place Ferrite Beads for Ground and
Shield Ground on opposite ends of PCB.
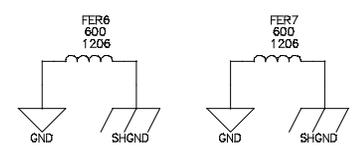
NOTE: Create Isolated (Trench) for Analog Plane
and connect planes with Ferrite Bead.
Place VR4 anf FER8 over trench and keep U3 as
close to FER8 as possible.

FER6
600
1206

FER7
600
1206

GND   SHGND   GND   SHGND

5V
2.5V

VR3
3 INPUT   OUTPUT 2
GND
1 ADP333BAKC-25
SOT-223

R33
0.00
RC05

CT14
1UF
A

C26
0.1UF
1206

CT15
1UF
A

C27
0.1UF
1206

FER8
600
1206

GND   AGND

Switch Operation:
Left Position; Pins 1, 4, 7, and 10 for PCI (PC Plugin) Power.
Right Position; Pins 3, 6, 9, and 12 for USB / Standalone Power

TABLE FOR QUICK SWITCH (U7) OPERATION

SWITCH (SW4) POSITION	MODE	QSWITCHSEL	DSPPERR CONNECTED TO:	DSPSERR CONNECTED TO:	DSPPCIRST CONNECTED TO:	DSPPCICLK CONNECTED TO:	JP5 JUMPER ON:
LEFT	PCI	LOGICAL '1'	PERR	SERR	PCIRST	PCICLK	N/A
RIGHT	USB	LOGICAL '0'	DMINUS	DPLUS	GND	GND	PINS 2 & 3
RIGHT	STAND ALONE	LOGICAL '0'	N/A	N/A	5V	GND	PINS 1 & 2

5V   5V

PCI5V   R35 0.00 RC05   VCC   R36 10K 1206

QSWITCHSEL

SW4 4P2T SWT011

VCC V_SELECT1 PCIVAUX   3V V_SELECT2 PCIVAUX
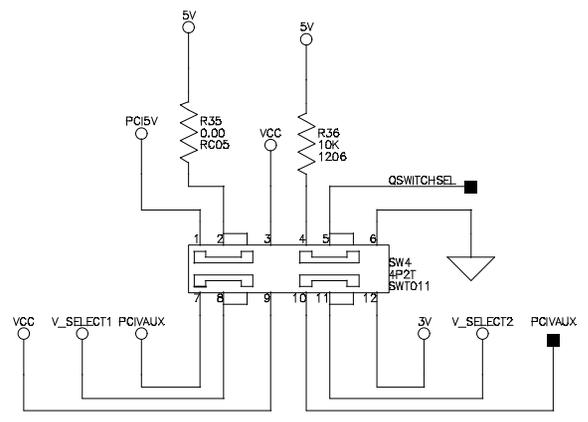
NOTE: R35 is a Zero Ohm Resistor.
It can be used to for current measurement.

NOTE: Place TestPoints Near Bread Board Area.

R37 1.50K 1206   PAR

USB CONNECTOR
P7
VCC   R38 0.00 1206
D-   DMINUS
D+   DPLUS   PERR
GND   R39 0.00 1206
SHELL   SERR
USB_TYPE_B
CON009

U7
2 0A   YA 4   DSPPERR
3 1A   YB 7   DSPSERR
5 0B   YC 9   DSPPCIRST
6 1B   YD 12   DSPPCICLK
11 0C
10 1C
14 0D
13 1D

5V

PCIRST
PCICLK

R40 10K 1206

QSWITCHSEL
1 S
15 E
QS3257Q
QSOP16

SHGND

JP5
1
2
3
IDC3X1
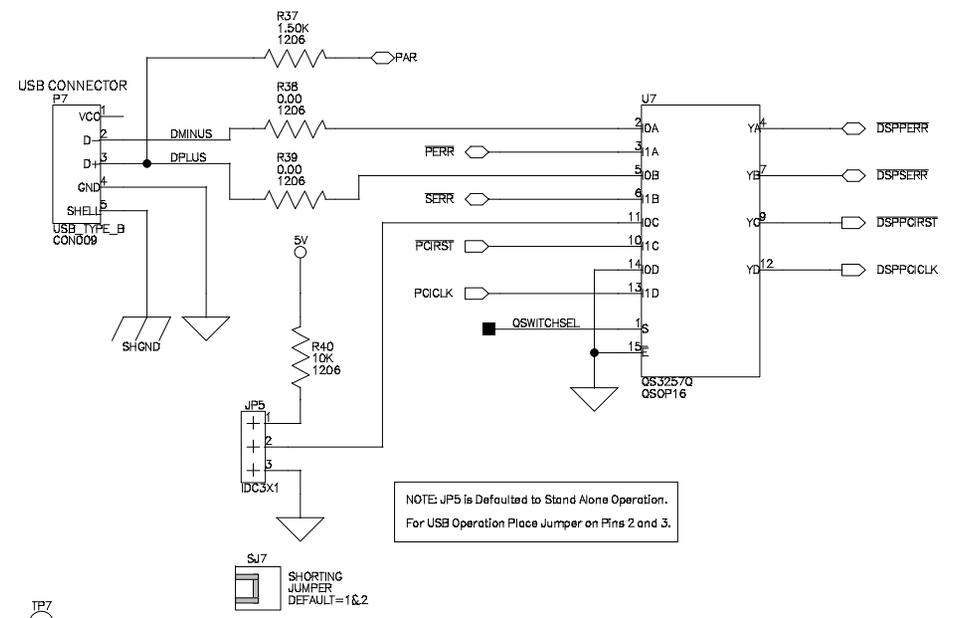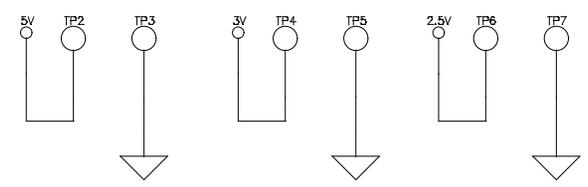
NOTE: JP5 is Defaulted to Stand Alone Operation.
For USB Operation Place Jumper on Pins 2 and 3.

SJ7
SHORTING JUMPER DEFAULT=1&2

5V TP2   TP3   3V TP4   TP5   2.5V TP6   TP7

REVISIONS

REV	ECO	DESCRIPTION	ENGR	DATE	APPR
1.0		New Release		07/18/00	
1.1		REFER TO ECO2000-098		10/06/00	

NOTE: Place Bypass Caps as close to Power pin as possible and connect directly to GND or AGND Plane.

PCIVDD Decoupling Caps for U1 (ADSP2192-12)
5V

C30 0.1UF 1206
C32 0.1UF 1206
C33 0.01UF 1206
C34 0.1UF 1206
C35 0.01UF 1206

IVDD Decoupling Caps for U1 (ADSP2192-12)
2.5V

C36 0.1UF 1206
C37 0.1UF 1206
C38 0.01UF 1206
C39 0.1UF 1206
C40 0.01UF 1206
C41 0.1UF 1206
C42 0.1UF 1206
C43 0.1UF 1206
C44 0.1UF 1206
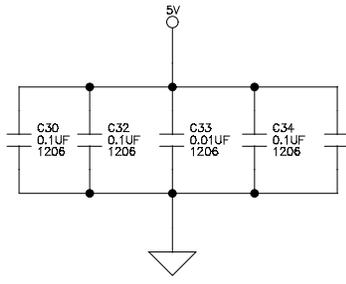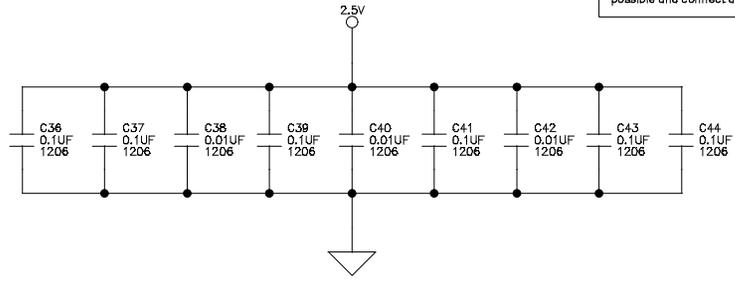
Decoupling Cap for U2 (NM93C56N)
5V

C72 0.1UF 1206
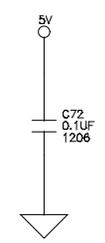
Decoupling Caps for P1 (PCI Connector)
Pins A10, A16, A59, B19, and B59
PCI5V

C73 0.01UF 1206
C74 0.01UF 1206
C75 0.01UF 1206
C76 0.01UF 1206
C77 0.01UF 1206
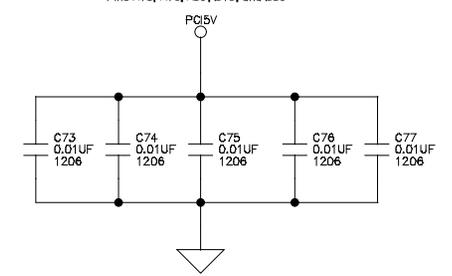
IOVDD/ACVDD[2:1] Decoupling Caps for U1 (ADSP2192-12)
3V

C31 0.01UF 1206
C45 0.1UF 1206
C46 0.1UF 1206
C47 0.1UF 1206

AVDD/RVDD
Decoupling Caps for U1 (ADSP2192-12)
5V

C48 0.1UF 1206
C49 0.1UF 1206
C50 0.1UF 1206
C51 0.1UF 1206
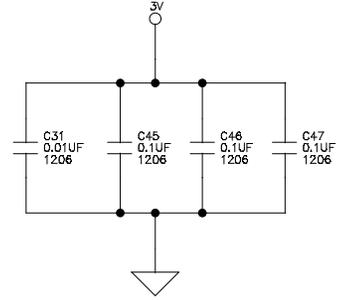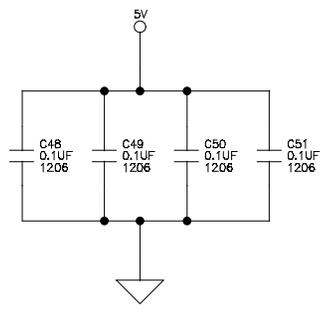
Digital Decoupling Caps for U3 (AD1885JST)
3V

CT18 10UF B
C52 0.1UF 1206
C53 0.1UF 1206
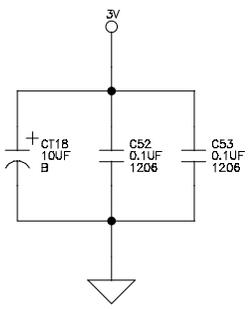
Analog Decoupling Caps for U3 (AD1885JST)
AVCC

CT19 10UF B
C54 0.1UF 1206
C55 0.1UF 1206
C56 0.1UF 1206

AGND
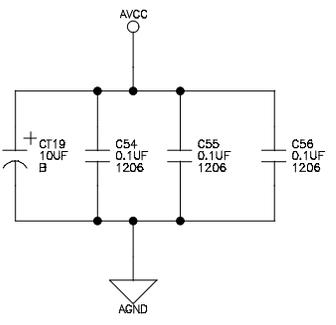
Decoupling Caps for P1 (PCI Connector)
Pins A08, A61, B06, and B61
PCI5V

C78 0.1UF 1206
C79 0.1UF 1206
C80 0.1UF 1206
C81 0.1UF 1206
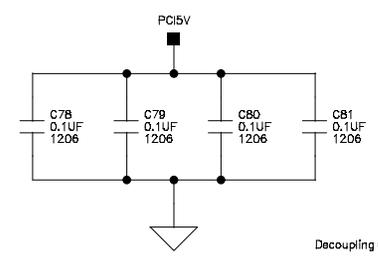
Decoupling Cap for U4 (74LVC14A)
2.5V

C82 0.1UF 1206
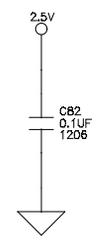
Decoupling Caps for P1 (PCI Connector)
Pins A05, A62, B05, and B62
PCI5V

CT20 10UF B
CT21 10UF B
CT22 10UF B
CT23 10UF B

Decoupling Caps for P1 (PCI Connector)
Pins A21, A27, A33, A39, A45, A53,
B25, B31, B36, B41, B43, and B54.

PCI3V

C57 0.01UF 1206
C58 0.01UF 1206
C59 0.01UF 1206
C60 0.01UF 1206
C61 0.01UF 1206
C62 0.01UF 1206
C63 0.01UF 1206
C64 0.01UF 1206
C65 0.01UF 1206
C66 0.01UF 1206
C67 0.01UF 1206
C68 0.01UF 1206
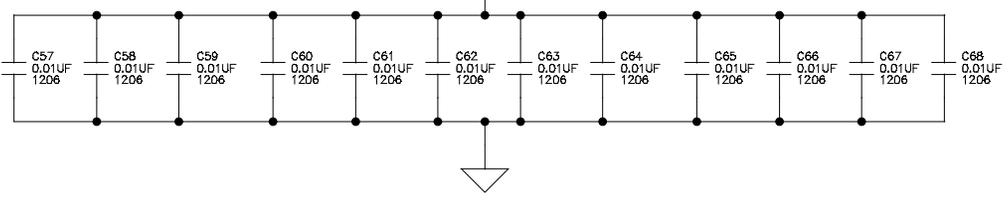
Decoupling Cap for U5 (74LVC14A)
3V
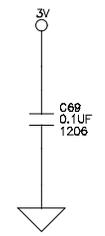
C69 0.1UF 1206

Decoupling Cap for U6 (ADM708SAR)
3V

C70 0.1UF 1206

Decoupling Cap for U7 (QS3257Q)
5V

C71 0.1UF 1206

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Approvals	Date
Drawn	10/13/00
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Engineering	

Title: ADSP2192-12 EZ-KIT LITE - BYPASS CAPS
Size: B
Board No.: A0159-2000
Rev: 1.1
Date: 10-20-2000_10:17
Sheet 8 OF 8

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