ADSP-21992 EZ-KIT LITE™

Evaluation System Manual

First Edition, October 2002

ANALOG DEVICES

Limited Warranty

The EZ-KIT Lite evaluation system is warranted against defects in materials and workmanship for a period of one year from the date of purchase from Analog Devices or from an authorized dealer.

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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. Store used EZ-KIT Lite boards in the protective shipping package.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1   INTRODUCTION

Thank you for purchasing the ADSP-21992 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-2199x fixed-point digital signal processors (DSPs). The VisualDSP++ development environment gives you the ability to perform advanced application code development and debug such as:

- Creating, compiling, assembling, and linking application programs written in C++, C, and ADSP-219x assembly
- Loading, running, stepping in, stepping out, stepping over, halting, and setting break points in application programs
- Reading and writing data and program memory
- Reading and writing core and peripheral registers
- Plotting memory

Access to the ADSP-2199x from a PC is achieved through a USB port or an optional JTAG emulator. The USB interface gives unrestricted access to the ADSP-21992 DSP 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/.

Example programs are provided with the ADSP-21992 EZ-KIT Lite to demonstrate the capabilities of the evaluation board.

Note: The VisualDSP++ license provided with this EZ-KIT Lite evaluation system limits use of program memory to 8K words.

The ADSP-21992 EZ-KIT Lite board features include:

- Analog Devices ADSP-21992 160 MHz mixed-signal DSP
- USB debugging interface
- Analog input circuitry
- 8-channel 12-bit DAC (AD5328BRU) on SPI interface
- PWM outputs interface
- External memory interface
- Encoder interface circuitry
- General-purpose I/O interface
- UART interface (RS-232)
- CAN interface circuitry
- Flash memory 512K x 8
- External SRAM 64K x 16
- Interface connectors
- 14-pin emulator connector for JTAG interface
- Analog inputs connector
- DAC outputs connector
- PWM outputs connector
- Encoder interface connector
- SPORT connector
- RS-232 connector
- External memory interface connector

The ADSP-21992 EZ-KIT Lite board has flash memory devices that can be used to store user-specific boot code. By configuring the jumpers for EPROM boot, the board can run as a stand-alone unit, without a PC. The ADSP-21992 EZ-KIT Lite package contains a flash programmer utility, which allows you to program the flash memory. The flash programmer is described in section 3.5.

Additionally, the ADSP-21992 EZ-KIT Lite board provides an expansion connector that allows you to connect to the processor's External Memory Interface (EMI).

1.1   For More Information About Analog Devices Products

Analog Devices can be accessed on the Internet at http://www.analog.com. You can directly access the Mixed-Signal and Motor Control DSP Web site at http://www.analog.com/motorcontrol and http://www.analog.com/technology/dsp/mixedsignal/index.html. These pages provide access to Mixed-Signal DSP and Motor Control specific technical information and documentation, product overviews, and product announcements. For specific information about DSP tools, go to http://www.analog.com/dsp/tools.

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

- FAX questions or requests for information to (781)-461-3010.
- Access the Computer Products Division File Transfer Protocol (FTP) site at ftp://ftp.analog.com or ftp://ftp.analogdevices.com/or ftp://137.71.25.69

1.2   For Technical or Customer Support

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

- DSP Tools technical support form:
  http://www.analog.com/technology/dsp/EZAnswers/index.html

- E-mail DSP tools questions to: dsptools.support@analog.com

- E-mail general ADSP-2199x questions to: MixedSignalDSP@analog.com

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

- Call: (800)-ANALOGD

1.3   Purpose of This Manual

The *ADSP-21992 EZ-KIT Lite Evaluation System Manual* provides directions for installing the hardware and software on your PC. This manual provides guidelines for running your own code on the ADSP-21992. Also, this manual provides a description of the use and configuration of the components on the evaluation board. Finally, schematics are provided for the ADSP-21992 EZ-KIT Lite board.

1.4   Intended Audience

This manual is a user's guide and reference to the ADSP-21992 EZ-KIT Lite evaluation system. DSP programmers who are familiar with Analog Devices fixed-point DSP architecture, operation and programming are the primary audience for this manual.

DSP programmers who are unfamiliar with Analog Devices DSPs can use this manual in conjunction with the *ADSP-2199x Mixed Signal DSP Hardware Reference* and the *ADSP-219x DSP Instruction Set Reference*, which describe the Analog Devices DSP architecture and DSP instruction set. DSP programmers who are unfamiliar with VisualDSP++ should refer to the VisualDSP++ Help menu and the *VisualDSP++ User's Guide*. For the locations of these documents, refer to section 1.6.

1.5   Manual Contents

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 the ADSP-21992 EZ-KIT Lite
  Provides information on the EZ-KIT Lite from a software perspective, and provides an easy-to-access memory map.

- Chapter 4 — Working With ADSP-21992 EZ-KIT Lite Hardware
  Provides information on the hardware aspects of the evaluation system.

- Appendix A — Schematics
  Provides the resources to allow ADSP-21992 EZ-KIT Lite board-level debugging or to use as a reference.

1.6   Online Help

Your software installation kit includes online Help as part of the Windows interface. These help files provide information about VisualDSP++ and the ADSP-21992 EZ-KIT Lite evaluation system.

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

To view Help on additional ADSP-21992 EZ-KIT Lite features, go to the Windows task bar and select Start\Programs\VisualDSP\EZ-KIT Help.

The documents in the following two tables can be found through online help or in the Docs folder of your VisualDSP++ installation. For more documentation, please go to:
http://www.analog.com/technology/dsp/developmentTools/gen_purpose.html.

Table 1-1: Related DSP Documents

Document Name	Description
ADSP-2199x DSP Data sheets	General functional description, pin-out, and timing.
ADSP-2199x DSP Hardware Reference Manual	Description of internal DSP architecture, mixed-signal peripherals, and all register functions.
ADSP-219x DSP Instruction Set Reference	Description of all allowed DSP assembly instructions.

Table 1-2: Related VisualDSP++ Documents

Document Name	Description
VisualDSP++ Users Guide for ADSP-21xx DSPs	Detailed description of VisualDSP++ features and usage.
VisualDSP++ Assembler and Preprocessor Manual for ADSP-219x DSPs	Description of the assembler function and commands for ADSP-219x family DSPs.
VisualDSP++ C/C++ Compiler and Library Manual for ADSP-219x DSPs	Description of the compiler function and commands for ADSP-219x family DSPs.
VisualDSP++ Linker and Utilities Manual for ADSP-21xx DSPs	Description of the linker function and commands for the ADSP-219x family DSPs.
VisualDSP++ Getting Started Guide for ADSP-21xx DSPs	Step-by-step tutorial that highlights the features of VisualDSP++ for ADSP-21xx DSPs.
VisualDSP++ Kernel (VDK) User's Guide	Description of the VDK function and commands for ADSP-219x DSPs.
VisualDSP++ Component Software Engineering User's Guide	Description of the VCSE function and commands for ADSP-219x DSPs.
VisualDSP++ Product Bulletin for ADSP-21xx DSPs	Description of the new features and enhancements of VisualDSP++.

If you plan to use the ADSP-21992 EZ-KIT Lite board in conjunction with a JTAG emulator, refer to the documentation that accompanies the emulator.

2   GETTING STARTED

2.1   Overview

This chapter provides you with the information you need to install the software for the ADSP-21992 EZ-KIT Lite evaluation system. Install your software and hardware in the order presented for correct operation. This chapter has the following sections:

- Contents of your EZ-KIT Lite Package (Section 2.2)
    Provides a list of the components shipped with this EZ-KIT Lite evaluation system.

- PC Configuration (Section 2.3)
    Describes the minimum requirement for the PC to work with the EZ-KIT Lite evaluation system.

- Installation Tasks (Section 2.4)
    Describes the step-by-step procedure for setting up the hardware and software.

2.2   Contents of your EZ-KIT Lite Package

Your ADSP-21992 EZ-KIT Lite evaluation system package contains the following items.

- ADSP-21992 EZ-KIT Lite Board
- VisualDSP++ CD with demo license, containing:
    - VisualDSP++ software
    - EZ-KIT Lite specific debug software
    - USB driver files
    - Example programs
    - *ADSP-21992 EZ-KIT Lite Manual* (this document)
    - Flash programmer utility
- *EZ-KIT Lite Quick Start Guide*
- *Installation Quick Reference card for VisualDSP++*
- 5 meter USB type A to type B 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 board contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store used EZ-KIT Lite boards in the protective shipping package.

WARNING!
ESD SENSITIVE DEVICE

2.3   PC Configuration

For correct operation of the VisualDSP++ software and the EZ-KIT Lite evaluation system, your computer must have the minimal configuration shown in Table 2-1.

Table 2-1: Minimum PC Configuration

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

➢ **Note: This EZ-KIT Lite does not run under Windows 95 or Windows NT.**

2.4   Installation Tasks

The following tasks are provided for the safe and effective use of the ADSP-21992 EZ-KIT Lite. Follow these instructions in the order presented to ensure correct operation of your software and hardware. Perform the following tasks to install the ADSP-21992 evaluation system.

1. Install VisualDSP++ software and EZ-KIT Lite debug software
2. Install VisualDSP++ license
3. Set up EZ-KIT Lite hardware
4. Install EZ-KIT Lite USB driver
5. Verify the USB driver installation
6. Start VisualDSP++

2.4.1 Install the VisualDSP++ Software

This EZ-KIT Lite comes with the latest version of VisualDSP++ for the ADSP-219x and ADSP-2199x DSP families.

1. Insert the VisualDSP++ CD-ROM into the CD-ROM drive.
2. If Auto Run is enabled on your PC, the home screen of the VisualDSP++ install wizard will appear. Otherwise, choose **Run** from the **Start** menu, and enter **D:\Setup.exe** in the

Open field, where D is the name of you local CD-ROM drive.

3. Click on the **VisualDSP++ 3.0 Installation** option.
4. Then select **Install Tools**. This will launch the setup wizard.
5. At the component selection screen, select the ADSP-21992 EZ-KIT Lite to install the EZ-KIT Lite debug software.
6. Follow this wizard with the on-screen instructions to continue installing the software.

2.4.2 Install the VisualDSP++ License

Before the VisualDSP++ software can be used, the license must be installed.

To install the VisualDSP++ license:

1. Ensure that VisualDSP++ has been installed.
2. Insert the VisualDSP++ CD-ROM into the CD-ROM drive if it is not already in the drive.
3. Once the CD-ROM browser appears on the screen, select **VisualDSP++ 3.0 Installation**. Then select **Install License**.
4. Follow the setup wizard instructions. (Note: You will need the serial number located on the back of the CD-ROM sleeve.)

2.4.3 Set up the EZ-KIT Lite Hardware

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. Store used EZ-KIT Lite boards in the protective shipping package.

The ADSP-21992 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. Use the following steps to connect the EZ-KIT Lite board:

1. Remove the ADSP-21992 EZ-KIT Lite board from the package. Be careful when handling the board to avoid the discharge of static electricity, which may damage components.
2. Table 2-2 shows the start-up default jumper settings. All other jumpers are not configured. For the configuration of the jumpers on the ADSP-21992 EZ-KIT Lite board, refer to the jumper settings in section, 4-35. Confirm that your board is set up in the default configuration.

JUMPER	POSITION
JP1	Closed – Ground Link
JP2	1-2 Position
JP3	1-2 Position
JP4	OPEN
JP5	2-3 Position
JP6	2-3 Position
JP7	2-3 Position
JP8	2-3 Position
JP12	CLOSED
JP15	CLOSED
JP16	CLOSED
JP24	CLOSED

Table 2-2: Start-up Default Jumper Settings
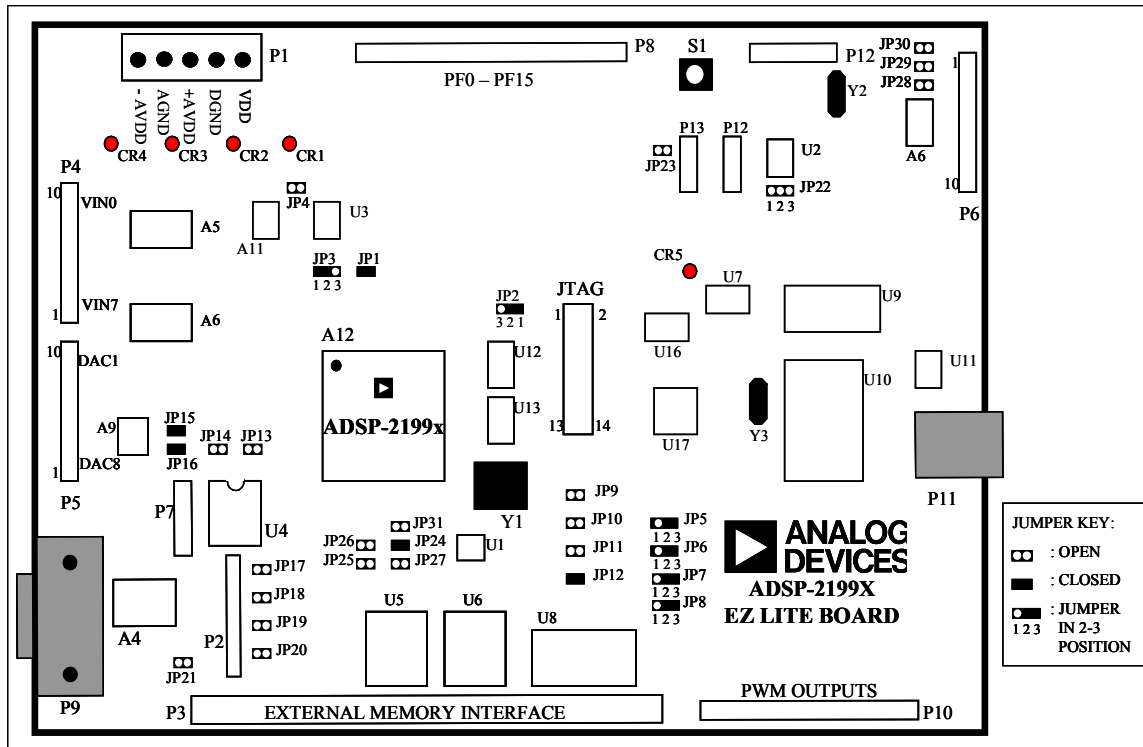
Figure 2-1: Default Jumper Settings

3. Connect your power supply to P1 on the EZ-KIT Lite board. The ADSP-21992 EZ-KIT Lite board contains a 5-way terminal block for connection of external power supplies. For correct operation, the following supplies are required:

- +5V, 800 mA (VDD)
- +5V, 60 mA (+AVDD)
- -5V, 60 mA (-AVDD)
- Digital Ground (DGND)
- Analog Ground (AGND)

Regulators on the board provide the required +3.3V, +2.5V, and ±2.5V.

4. Connect the USB cable to an available full-speed USB port and to P11 on the ADSP-21992 EZ-KIT Lite board.
5. Follow the USB driver installation instructions in section 2.4.4.

2.4.4 Install the EZ-KIT Lite USB Driver

The EZ-KIT Lite evaluation system can be installed on Windows 98, Windows 2000, and Windows XP. One full-speed USB port is also required. Section 2.4.4.1 describes the installation on Windows 98. Section 2.4.4.2 describes the installation on Windows 2000. Section 2.4.4.3 describes the installation on Windows XP. The following installation procedures use the ADSP-21990 as an example. Figures 2-5, 2-9, 2-14, and 2-17 display "ADSP-21990 EZ-KIT Lite" if connected to an ADSP-21990 EZ-KIT Lite board, but display "ADSP-21992 EZ-KIT Lite" when connected to a ADSP-21992 EZ-KIT Lite board.

2.4.4.1 Windows 98 USB Driver Installation

Before using the ADSP-21992 EZ-KIT Lite for the first time, the Windows 98 USB driver must first be installed. This is accomplished as follows:

1. Insert the VisualDSP++ installation CD-ROM into the CD drive.

The connection of the device to the USB port will activate the Windows 98 **Add New Hardware Wizard** as shown in Figure 2-2.

Figure 2-2: Add New Hardware Wizard Dialog Box

2. Click **Next**.
3. Select **Search for the best driver for your device** as shown in Figure 2-3.

Figure 2-3: Search for the driver

4. Click **Next**.
5. Ensure that the **CD-ROM drive** is selected as shown in Figure 2-4.

Figure 2-4: Search the CD-ROM

6. Click **Next**.

Windows 98 will locate the WmUSBEz.inf file on the CD-ROM as shown in Figure 2-5.
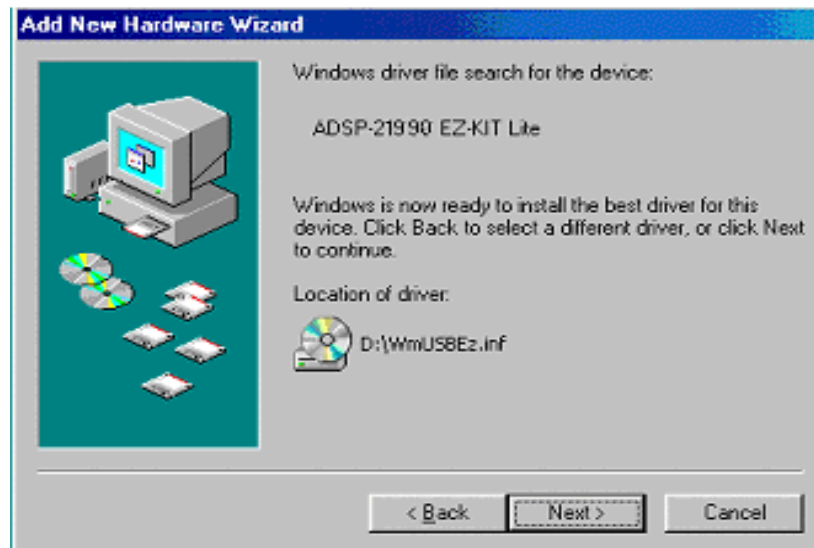
Figure 2-5: The Driver is Located

7. Click **Next**.
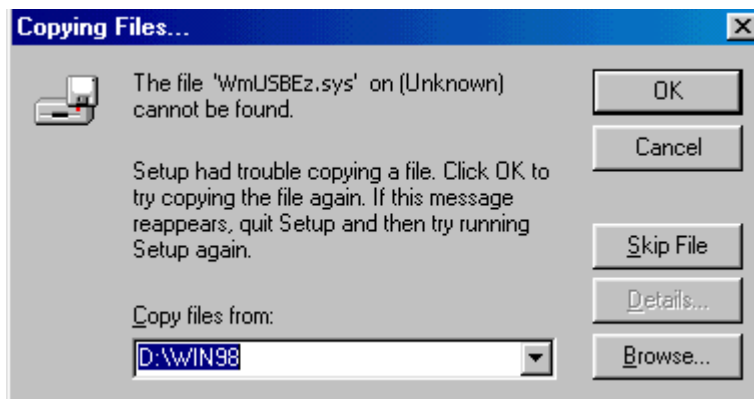
Figure 2-6: Copy Files Dialog Box

8. Click **Browse**.
9. In **Drives** (Figure 2-7), select your CD-ROM drive.
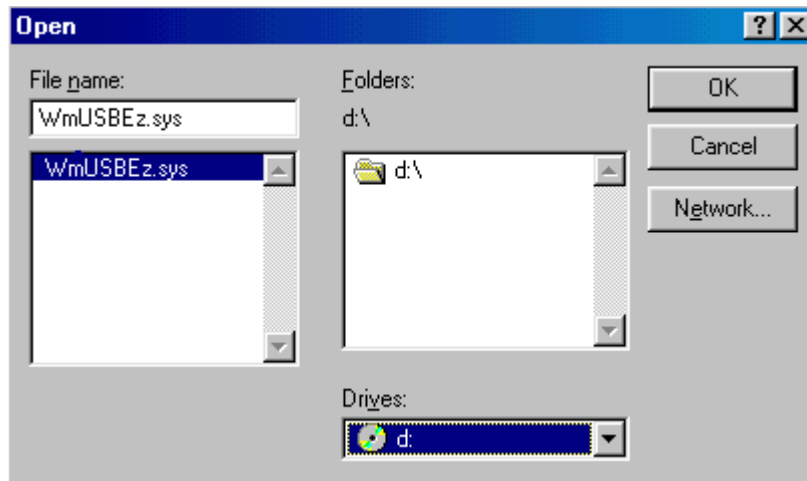
Figure 2-7: Open the .sys File

10. Click **OK**.

The Copying Files dialog box (Figure 2-8) will appear.
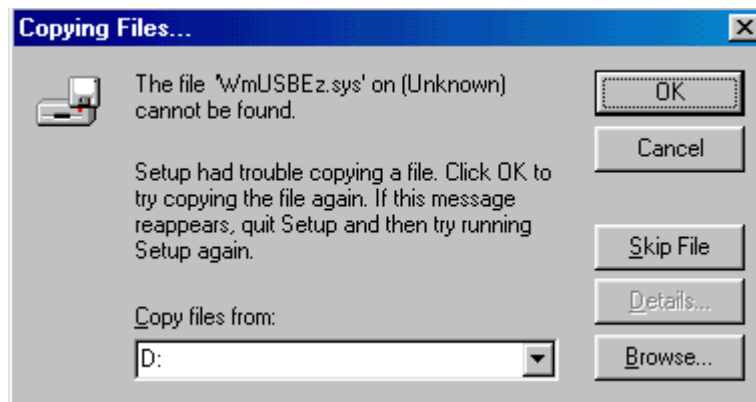
Figure 2-8: Copying Files

11. Click **OK**.

The driver installation is now complete as shown in Figure 2-9.

Figure 2-9: Finish the Software Installation

12. Click **Finish** to exit the wizard.

13. Verify the installation by following the instructions in section 2.4.5.

2.4.4.2 Windows 2000 USB Driver Installation

Before using the ADSP-21992 EZ-KIT Lite for the first time, the Windows 2000 driver must first be installed. This is accomplished as follows:

1. Insert the VisualDSP++ CD-ROM into the CD-ROM drive.

The connection of the device to the USB port will activate the Windows 2000 **Found New Hardware Wizard** as shown in Figure 2-10.
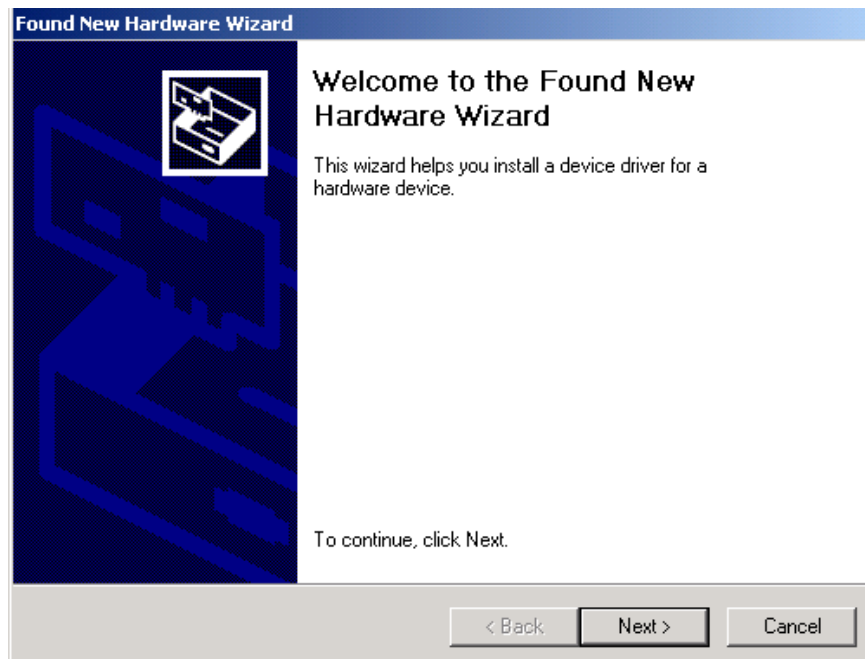
Figure 2-10: Found New Hardware Wizard

2. Click **Next**.
3. Select **Search for a suitable driver for my device** as shown in Figure 2-11.

Figure 2-11: Search for a Suitable Driver

4. Click **Next**.

5. Ensure the **CD-ROM drive** is selected as shown in Figure 2-12.
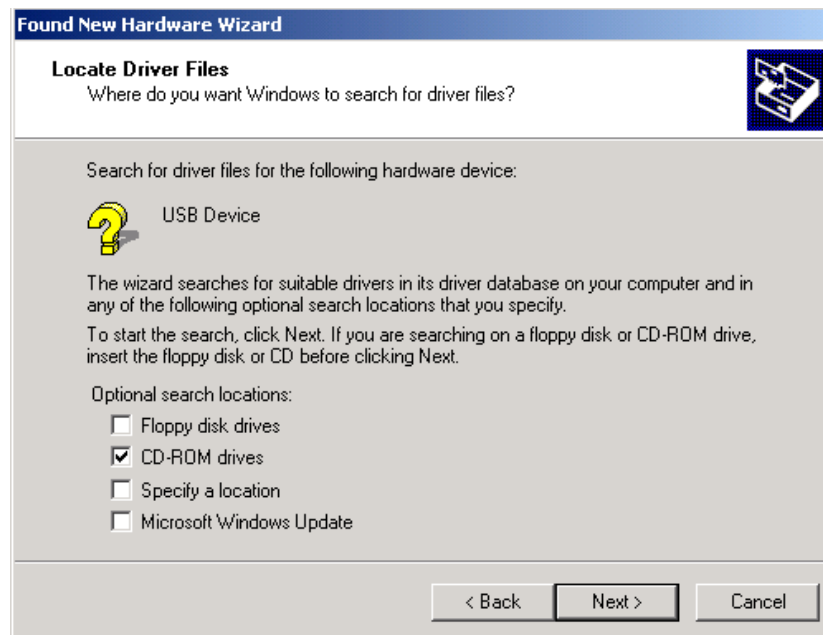
Figure 2-12: Locate Driver Files

6. Click **Next**.

Driver Files Search Results dialog box (Figure 2-13 appears.
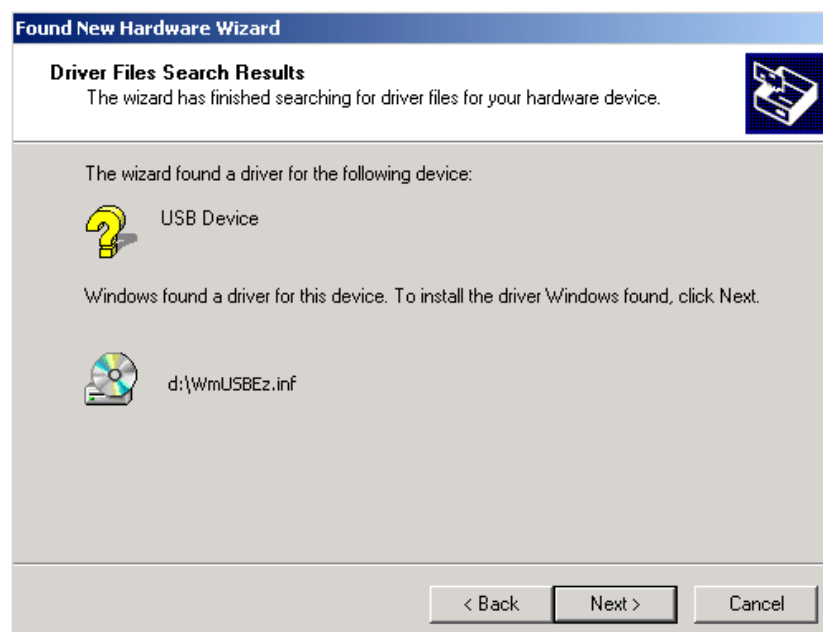
Figure 2-13: Driver File Search Results

7. Click **Next**.

Windows 2000 will automatically install the driver. The driver installation is now complete as shown in Figure 2-14.
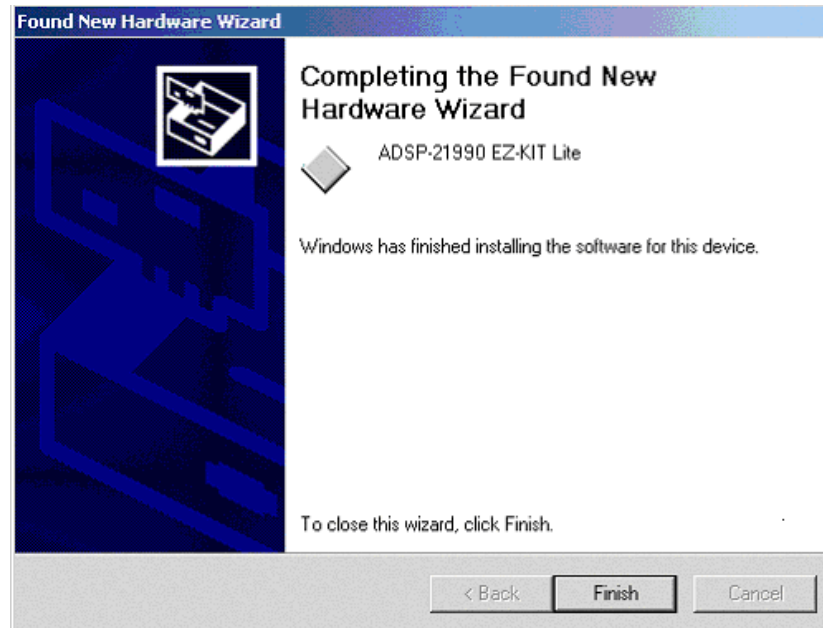
Figure 2-14: Completing Driver Installation Dialog Box

8. Click **Finish** to exit the wizard.

9. Verify the installation by following the instructions in section 2.4.5.

2.4.4.3 Windows XP USB Driver Installation

The Windows XP USB driver must first be installed before using the ADSP-21992 EZ-KIT Lite evaluation system for the first time.

1. Insert the VisualDSP++ CD-ROM into the CD drive.

The connection of the device to the USB port will activate the Windows XP **Found New Hardware Wizard** as shown in Figure 2-15.

Figure 2-15: Found New Hardware Wizard

2. Select **Install** from a list or specific location.
3. Click **Next**.

Chose your search and installation options. Figure 2-16 appears.
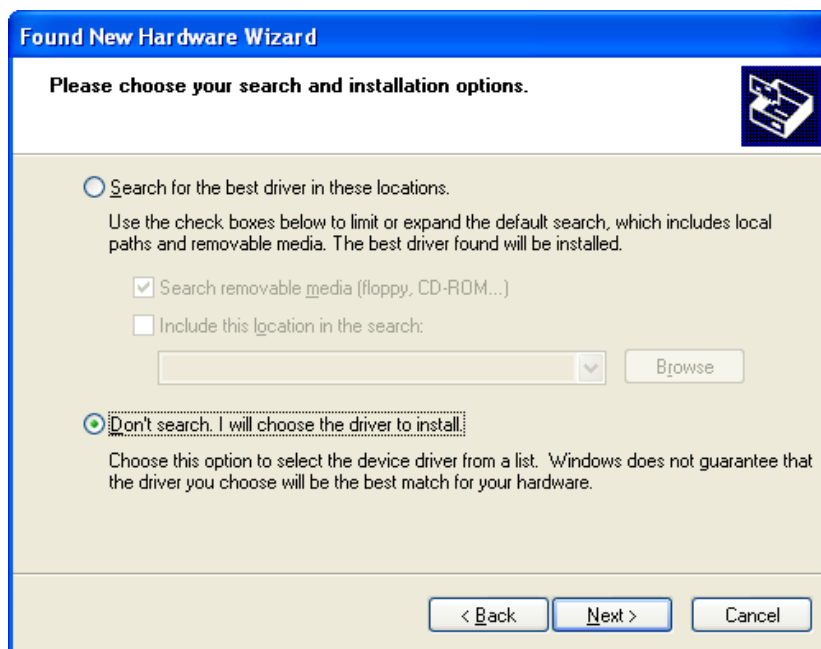
Figure 2-16: Don't search, I will choose.

4. Select **Don't search. I will choose the driver to install**.
5. Click **Next**
6. Figure 2-17 will appear.
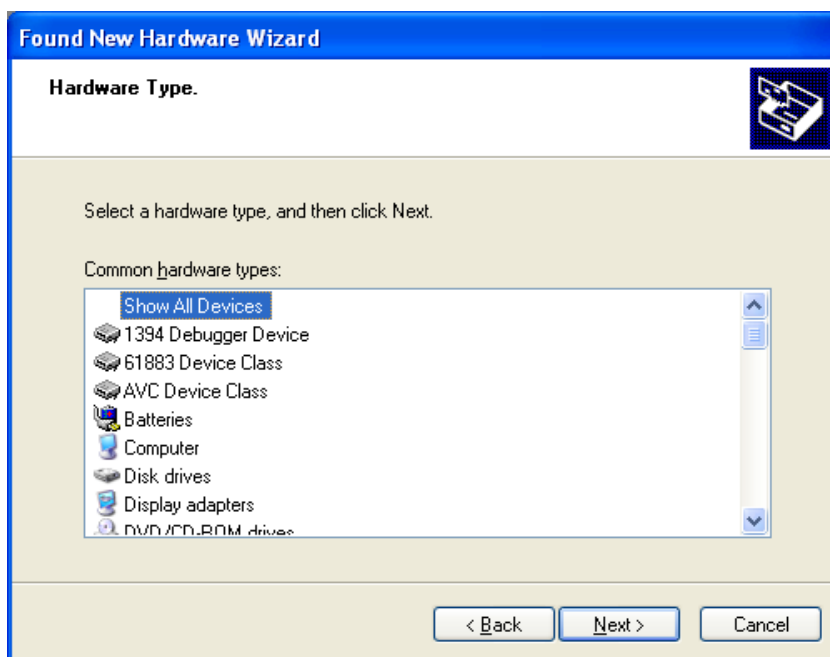
Figure 2-17 Show All Devices

7. Select **Show All Devices** as shown in Figure 2-17, and click Next.
8. After a minute or 2, all devices will appear. Click **Have Disk** from the dialog shown in Figure 2-18.
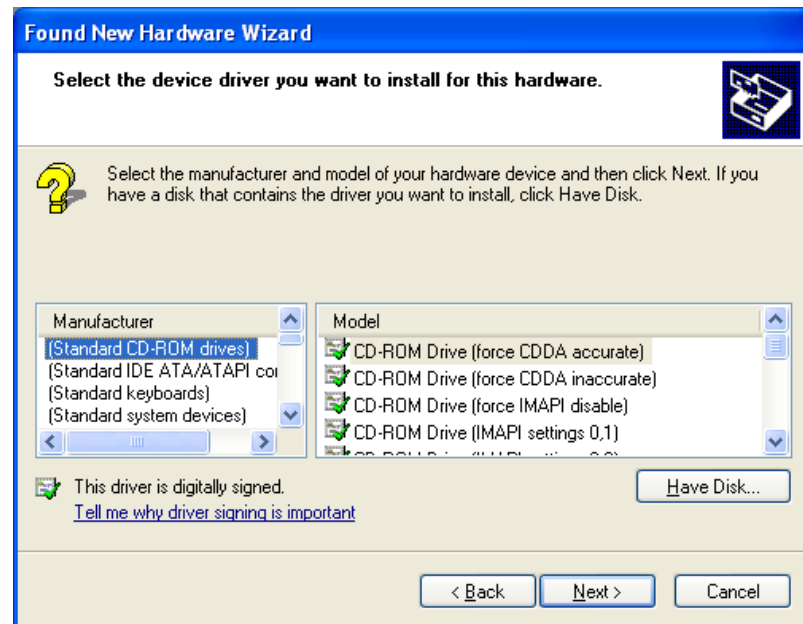
Figure 2-18 Select Manufacturer and Model

9. The **Install from Disk** dialog will appear as shown in Figure 2-19.
10. Browse to the location of the WmUSBEz.inf file and click **OK**.
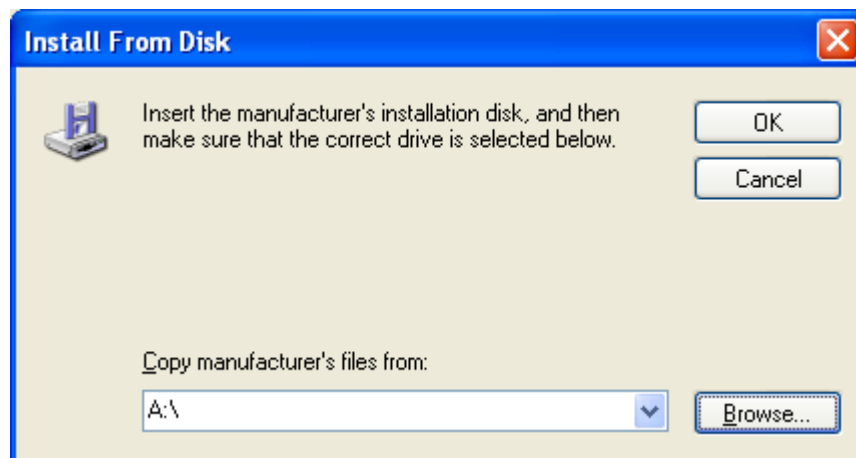
Figure 2-19 Install From Disk

11. Figure 2-20 appears.
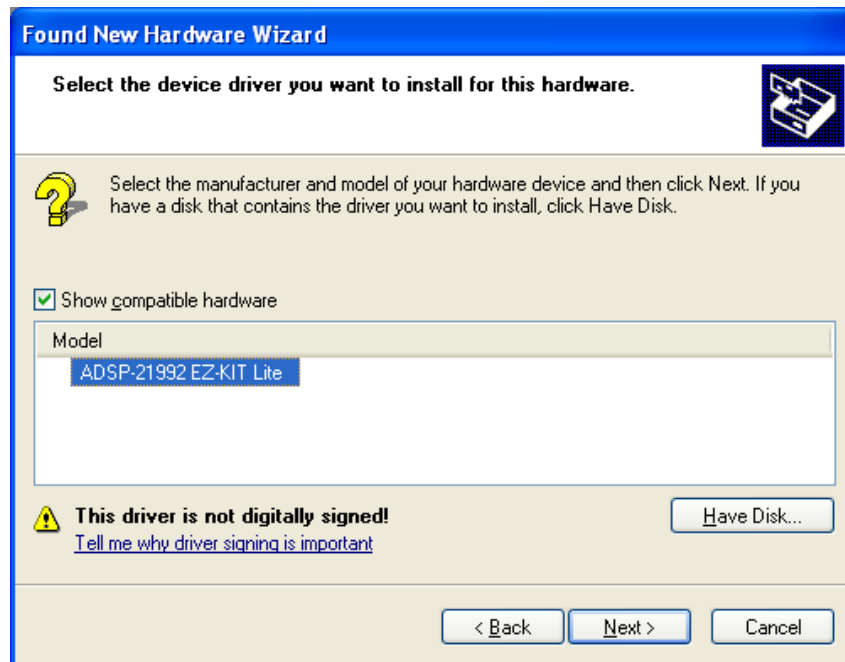
Figure 2-20 Select the device driver

12. The **ADSP-21992 EZ-KIT Lite** should appear under Model. Click **Next**.

Windows XP will automatically install the driver. The driver installation is now complete as shown in Figure 2-21.
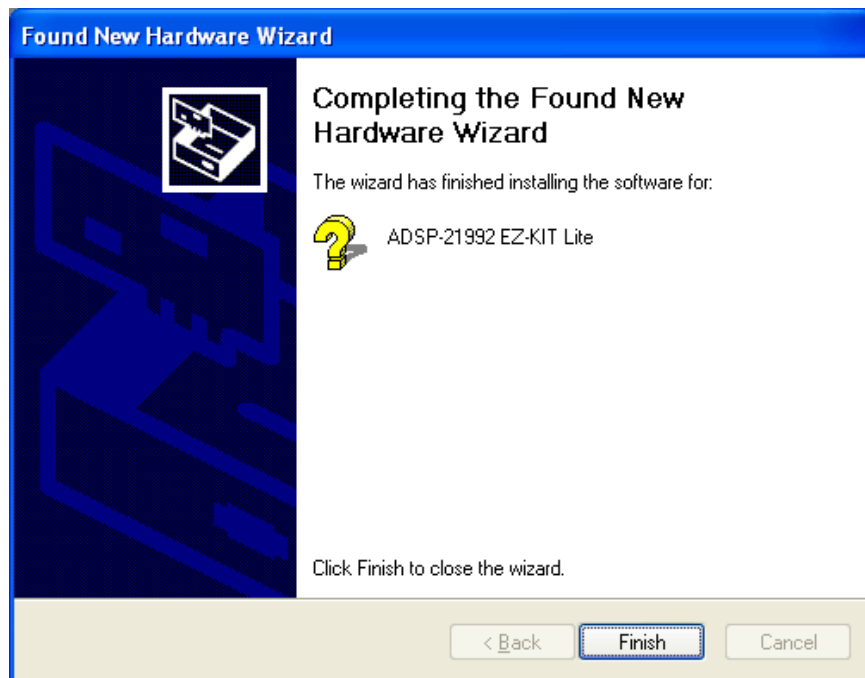
Figure 2-21: Completing Driver Installation Dialog Box

13. Click **Finish** to exit the wizard.
14. Verify the installation by following the instructions in section 2.4.5.

2.4.5 Driver Installation Verification

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 (S1) on the evaluation board.
3. Verify that the red USB monitor LED (CR7) is lit. This signifies that the board is communicating properly with the host PC, and is ready to run VisualDSP++.

2.4.6 Starting VisualDSP++

In order to start debugging, you must set up a session in VisualDSP++.

1. Hold down the **Control** (CTRL) key.
2. Click the **Start** button on the Windows taskbar, and then choose **Programs**, **VisualDSP, VisualDSP++ for 21xx**.

The **Session List** dialog box appears if you already have existing sessions. Skip to step 4 if this is the first time running VisualDSP++.

3. Click **New Session**.
4. The **New Session** dialog box will appear as shown in Figure 2-22.
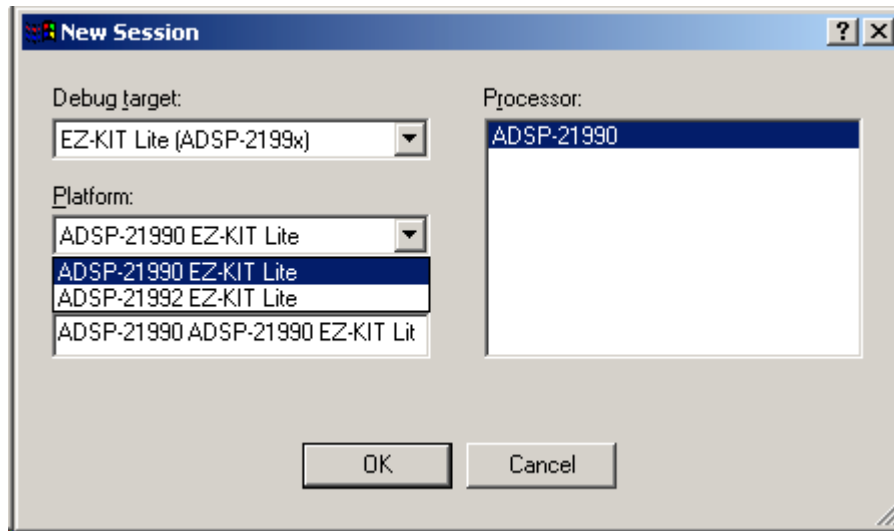
Figure 2-22: New Session Dialog Box

5. In **Debug Target**, choose **EZ-KIT Lite (ADSP-2199x)**.
6. In **Platform**, choose the correct platform type **ADSP-21990** or **ADSP-21992**.
7. Type the target name in **Session Name** or accept the default name.
8. Click **OK** to return to the **Session List**, ensure the new session is highlighted, and click **Activate**.

3   USING THE EZ-KIT LITE

3.1   Overview

This chapter provides specific information to assist you with developing your programs with the ADSP-21992 EZ-KIT Lite board. This information appears in the following sections:

- EZ-KIT Lite License Restrictions (Section 3.2)
  Describes the restrictions of the EZ-KIT Lite demo license.

- Memory Map (Section 3.3)
  Defines the memory map to assist in developing programs for the EZ-KIT Lite evaluation system.

- Example Programs (Section 3.4)
  Provides information about the example programs included in the ADSP-21992 EZ-KIT Lite evaluation system.

- Using the Flash Programmer Utility (Section 3.5)
  Provides information on the flash programmer utility included with VisualDSP++.

This section provides programming information specific to the EZ-KIT Lite board. For more detailed information about programming the ADSP-21992, see the documents referenced in section 1.6.

3.2   EZ-KIT Lite License Restrictions

The license shipped with the ADSP-21992 EZ-KIT Lite imposes the following restrictions:

- Program Memory (PM) space is limited to 8K words (1/4 of the ADSP-21992 PM space).
- No connections to Simulator or Emulator sessions are allowed.

3.3   Memory Map

The ADSP-21992 has 48K words of internal SRAM that can be used for program storage or data storage. The configuration of internal SRAM is detailed in the *ADSP-2199x DSP Hardware Reference*.

The ADSP-21992 EZ-KIT Lite board provides 512K x 8 bits of external flash memory. These flash memory ICs are connected to the boot memory select ($\overline{\text{BMS}}$) pin, or to the memory select 0 pin ($\overline{\text{MS0}}$) via a 2-input AND Gate (U1). Jumper JP31 is placed on the $\overline{\text{MS0}}$ line to disconnect the $\overline{\text{MS0}}$ pin if required. The flash memory can be accessed in either the boot memory space or the external memory space,.

If booting from the external flash memory IC, JP31 **can** be left open. In this case, the external SRAM provided on the ADSP-21992 EZ-KIT Lite board can be mapped to any of the external memory banks using one of the jumpers, JP24 – JP27.

If not booting from the flash memory, but using it as external program or data memory, JP31 **must** be closed. In this case the external SRAM provided on the ADSP-21992 EZ-KIT Lite board should not be mapped to external memory bank 0 (JP24 should be open in this case) and can be mapped to any of the other external memory banks using one of the jumpers, JP25 – JP27.

When using the external memories provided on the ADSP-21992 EZ-KIT Lite board, they are mapped at the start address of the chosen external memory bank.

Table 3-1: ADSP-21992 Memory Map

	Start Address	End Address	Page	Content
Internal Memory	0x00 0000	0x00 7FFF	0	32K x 24-Bit Program Memory
	0x00 8000	0x00 BFEF	0	16K x 16-Bit Data Memory
	0x00 C000	0x00 FFFF	0	RESERVED (16K)
External Memory (at reset)	0x01 0000	0x3F FFFF	1-63	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 0FFF	255	4K x 24-Bit Boot ROM (Internal)
	0xFF 1000	0xFF FFFF	255	RESERVED (Internal)
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

➢ **NOTE: Although the flash starts at address 0x01 0000 in the boot memory space, during EPROM boot the address 0x00 0000 is put on the address bus.**

➢ **NOTE: Only 8K of program memory is available in the EZ-KIT Lite software.**

3.4   Example Programs

Example programs are provided with the ADSP-21992 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-21990\Examples**. Please refer to the example program readme files for more information.

3.5 Using the Flash Programmer Utility

The ADSP-21992 EZ-KIT Lite evaluation system includes a flash programmer utility. The utility allows you to program the flash on the ADSP-21992 EZ-KIT Lite board. This utility must be installed separately from the debug software. To install the utility, insert the VisualDSP++ CD-ROM and follow the steps in the installation wizard. For more information on the flash programmer utility, from the Windows **Start** button choose **Programs\VisualDSP\Flash Programmer Help**.

4   EZ-KIT LITE HARDWARE REFERENCE

4.1   Overview

This chapter describes the hardware design of the ADSP-21992 EZ-KIT Lite board. The following topics are covered:

- System Architecture (Section 4.2)

  Describes the configuration of the DSP as well as all a description of how all of the components on the board interface with the DSP.

- Jumper Settings (Section 4.3)

  Shows the location and describes the function of all the configuration jumpers.

- Connectors (Section 4.4)

  Shows the location and gives a description and pin-out of all connectors on the ADSP-21992 EZ-KIT Lite board.

- Mechanical Dimensions (Section 4.5)

  Gives the physical dimensions of the ADSP-21992 EZ-KIT Lite board.

4.2   System Architecture

The ADSP-21992 EZ-KIT Lite board has been designed to provide access to all of the capabilities of the ADSP-21992 DSP. This section describes the DSP's configuration on the EZ-KIT Lite board.
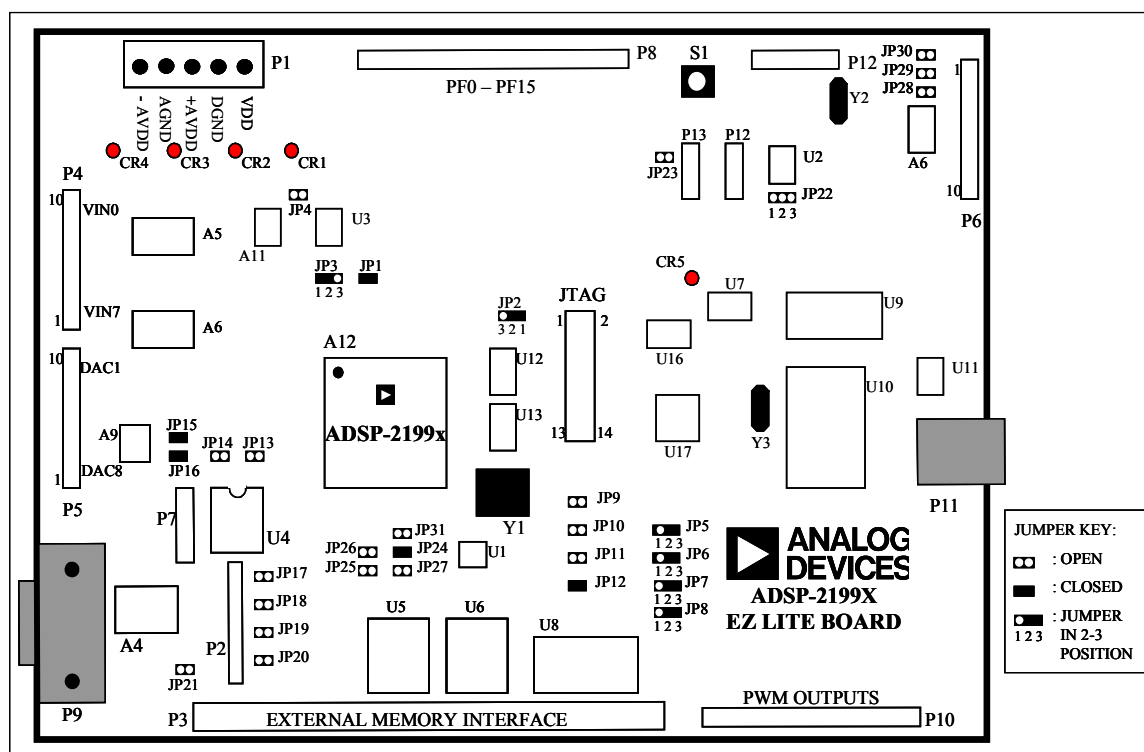
Figure 4-1: EZ-KIT Lite Board Layout

The ADSP-21992 EZ-KIT Lite board can be configured to boot in all of the possible ADSP-21992 boot modes. For information about configuring the boot mode, see section 4.3.1.

The DSP core voltage is 2.5V, and the external interface operates at 3.3V. The analog input signal conditioning circuitry requires ±2.5V.

4.2.1 Power Supplies

Linear regulators are provided on the ADSP-21992 EZ-KIT Lite board for the 2.5V and 3.3V required by the ADSP-21992 from a 5V source. The linear regulators also provide the power for the digital peripheral circuitry on the ADSP-21992 EZ-KIT Lite board.

Linear regulators are also provided for the ±2.5V from ±5V sources, required by the analog input signal-conditioning circuitry.

Appropriate decoupling capacitors are provided on the ADSP-21992 EZ-KIT Lite board for all power supply inputs (VDD, +AVDD, and -AVDD) to reduce noise coupling from the external power supplies. However, for best performance, well-regulated external power supplies and correct wiring are recommended.

The ADSP-21992 EZ-KIT Lite board is laid out with separate analog and digital ground planes, labeled AGND and DGND, respectively. JP1 is a link that connects the analog and digital ground planes of the ADSP-21992 EZ-KIT Lite board.

 NOTE: For correct operation, this link must not be removed.

The arrangement on the input power supply connector is illustrated in Figure 4-2.

-AVDD (-5V)	●	5
AGND	●	4
+AVDD (+5V)	●	3
DGND	●	2
VDD (+5V)	●	1

P1
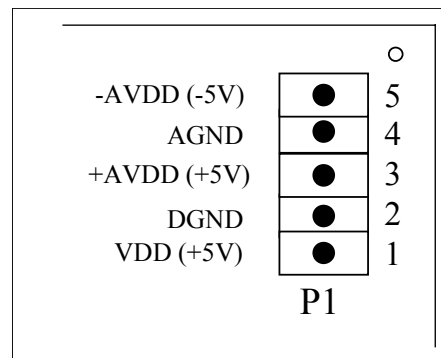
Figure 4-2: Power Supply Connector of ADSP-21992 EZ-KIT Lite Board

LEDs are provided to indicate that the power supplies are working correctly. The Power Supply LEDs are listed in Table 4-1:

LED	Power Supply Signal
CR1	+2.5V (DSP Core Voltage Supply)
CR2	+3.3V (Vddext)
CR3	+2.5V (+AVdd)
CR4	- 2.5V (-AVdd)

Table 4-1: Power Supply LEDs

4.2.2 Reset Generation

The ADSP-21992 can be reset from a number of sources on the ADSP-21992 EZ-KIT Lite board. The sources of reset for the ADSP-21992 DSP are:

- POR (power-on reset output pin of the ADSP-21992)
- Reset button (S1)
- External power on reset IC (A7)
- USB Interface (software tools reset)

The source of reset for the ADSP-21992 can be chosen by configuring jumper JP2. When JP2 is in the 2-3 position, the POR output pin of the ADSP-21992 is tied to the reset pin of the ADSP-21992. When JP2 is in the 1-2 position, the source of reset for the ADSP-21992 is the reset button (S1), the external power-on reset IC (ADM708), or a reset command from VisualDSP++ through the USB interface. The 1-2 position is the default and recommended configuration when using the VisualDSP++ development tools.

4.2.3 Analog Input Interface

The ADSP-21992 EZ-KIT Lite board permits up to eight analog inputs to be fed from the analog inputs connector, P4, to the eight ADC channels of the ADSP-21992. All eight analog inputs at the analog inputs connector may range from -1V to +1V.

There is a separate interface circuit for each of the eight ADC channels of the ADSP-21992. These analog interface circuits convert the nominal ±1 V signals at the analog inputs connector P4 to signals centered on the ADSP-21992 reference voltage level (either the internally derived 1.0V level or the externally provided 1.024V level). The analog interface circuits, consisting of high-performance operational amplifiers and precision resistors, effectively offset the analog inputs by the reference voltage level.

Two AD8044 quad operational amplifiers (A5 & A6) are used for the analog interface and are configured as summing unity-gain stages. A5 is used to interface the VIN0, VIN1, VIN2, and VIN3 analog inputs. A6 is used to buffer the VIN4, VIN5, VIN6, and VIN7 inputs.

Precision 10 KΩ resistors for input and feedback ensure accurate gain matching of all channels. In addition, 47 pF feedback capacitors provide simple low-pass filtering with a very high cut-off frequency (339 kHz) on all analog inputs.

The analog inputs are applied to the ADSP-21992 in a single-ended fashion, so that the inverting inputs to the sample-and-hold amplifiers of the ADSP-21992 (ASHAN and BSHAN) are connected to a buffered version of the reference voltage. A representation of the analog interface circuit for one of the ADC channels is shown in Figure 4-3. As shown in the schematics at the end of this document, each analog input stage also contains a small RC filter at the operational amplifier output.
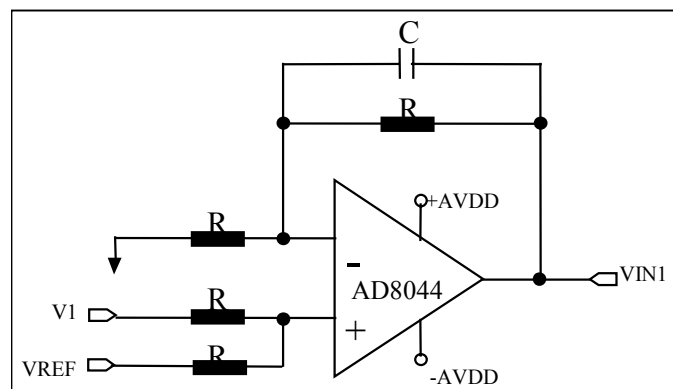
Figure 4-3: One Analog Interface Circuit of ADSP-21992 EZ-KIT Lite Board

4.2.4 Reference Voltage Generation

The ADSP-21992 EZ-KIT Lite board contains an external voltage reference, the LM4140-1.0 (U3), which provides a precise 1.024V output. The ADSP-21992 EZ-KIT Lite board can be configured to operate from the internal (ADSP-21992 generated) or the external voltage reference. Two jumpers control the selection of the internal or external voltage reference.

Jumper JP3 ties the SENSE pin of the ADSP-21992 to the AVDD or GND levels. Connecting SENSE to AVDD (JP3 in position 2-3) selects external voltage reference operation. In this mode, the ADSP-21992 accepts an input voltage reference at the VREF pin. To connect the external voltage reference to the ADSP-21992 on the evaluation board, to close the JP4 jumper. This connects the external voltage reference from the LM4140-1.0 to the VREF pin of the ADSP-21992. The signal, which is buffered using an operational amplifier OP193 (A11), level-shifts the applied analog input signals on the analog inputs connector, P4, (as well as being connected to the ASHAN and BSHAN inputs to the sample-and-hold amplifiers).

To operate with the internally derived voltage reference of the ADSP-21992, the JP3 jumper must be tied in position 1-2 to connect the SENSE pin to AGND. Additionally, jumper JP4 must be left open. The ADSP-21992 provides a 1V reference at the VREF pin that is buffered and applied to the ASHAN and BSHAN inputs. The buffered VREF signal is also used in the level-shifting circuitry.

In summary, the appropriate settings for jumpers JP3 and JP4 for internal and external voltage reference operation are:

> INTERNAL Reference: JP3 in position 1-2, JP4 open

> EXTERNAL Reference: JP3 in position 2-3, JP4 closed

4.2.5 External Memory Interface (EMI)

A 64K by 16-bit SRAM IC (U8) is provided on the External Memory Interface (EMI) of the ADSP-21992 EZ-KIT Lite board.

Sockets are provided on the ADSP-21992 EZ-KIT Lite board so that the EMI can also be connected to two 512K x 8-bit flash memory ICs (U5, U6). These flash memory ICs are connected to the boot memory select pin ($\overline{\text{BMS}}$) and the memory select 0 pin ($\overline{\text{MS0}}$), allowing the flash memory to boot the DSP as well as store information during normal operation. 8-bit wide (and 16-bit, if implemented in boot ROM) booting is possible. Refer to section 3.3 for information about the location of the flash memory in the DSP's memory map.

Jumpers are provided to allow mapping RAM into different banks, and a two input AND gate, with a jumper, allows for mapping flash into boot memory space or $\overline{\text{MS0}}$.

All address, data, and control signals are available externally on a connector. The pin-out of the EMI connector (P3) can be found in the schematics in APPENDIX A: SCHEMATICS.

4.2.6 SPI Interface

The SPI signals (MISO, MOSI, and SCK) are available on connector P7.

4.2.7 SPI EEPROM

A socket for an 8-pin SPI Serial EEPROM (64K x 8-bit), such as the Microchip 25LC640, is provided on the ADSP-21992 EZ-KIT Lite board, for booting and/or data storage. The PF1/ SPISEL1 pin of the ADSP-21992 is used to select the SPI Serial EEPROM to be active on the SPI interface. Jumper JP14 is used to disable the EEPROM when the PF1/ SPISEL1 pin of the ADSP-21992 is being used as a programmable flag pin.

4.2.8 SPI Digital-to-Analog Converter

An 8-channel, serial, 12-bit DAC (A9) is provided on the ADSP-21992 EZ-KIT Lite board. The PF2/ SPISEL2 pin of the ADSP-21992 is used to select the DAC (AD5328BRU) to be active on the SPI interface. PF3 is used to update the DAC registers. Two jumpers, JP15 and JP16, are used to disable the DACs when the PF2 and PF3 pins are being used as programmable flag pins.

The outputs of the DAC are available at connector P5. Refer to Table 4-5 in section 4.4 for the configuration of P5.

4.2.9 CAN Interface

A CAN transceiver IC (U2) is provided on the SPI Interface. The CAN transceiver IC converts the input and output to the CAN bus voltages levels. Connectors P12 and P13 provide connections to the user's CAN bus and allow easy daisy-chaining of CAN devices. CAN bus termination of 120Ω can be provided by closing jumper JP23.

4.2.10 Serial Port (SPORT) Interface

The SPORT pins are available at the SPORT interface connector, P2. Refer to Table 4-3 in section 4.4 for the configuration of P2.

Circuitry is also provided on the ADSP-21992 EZ-KIT Lite board to allow you to use the SPORT for RS-232 emulation. An ADM3202ARN line driver/receiver (A4) is provided to convert the SPORT signals to the appropriate ±10 V levels suitable for the UART connection to the PC. A standard 9-pin female D-sub socket, P9, is provided on the ADSP-21992 EZ-KIT Lite board

Jumpers JP18, JP19, and JP20 connect the SPORT signals to the RS-232 circuitry. All three jumpers must be closed to use the RS-232 interface circuitry.

4.2.11 Programmable Flag Pins Interface

All programmable flag pins are available on connector P8. Refer to Table 4-8 in section 4.4 for the configuration of P8.

4.2.12 PWM Generation Unit Interface

All six PWM output signals, AH–CL, are available at the PWM output connector, P10. The PWMSYNC output is also available at the connector, P10. A $\overline{\text{PWMTRIP}}$ input can be applied at connector P10. Refer to Table 4-10 in section 4.4 for the configuration of P10.

Three jumpers are provided for the configuration of the PWM Generation Unit of the ADSP-21992. JP5 is used to enable/disable the $\overline{\text{PWMTRIP}}$ input. JP6 is used to enable/disable PWM switched reluctance mode. JP7 configures the polarity of the PWM output signals.

4.2.13 Auxiliary PWM Unit Interface

Both AUXPWM outputs signals, AUX0 and AUX1, are available on connector P10. An $\overline{\text{AUXTRIP}}$ input can be applied at connector P10. A jumper, JP8, is provided to enable/disable the $\overline{\text{AUXTRIP}}$ input signal. Refer to Table 4-10 in section 4.4 for the configuration of P10.

4.2.14 General-Purpose Timer Signals

The three general-purpose timer input/output signals (TMR0, TMR1, and TMR2) are available at connector P10. Refer to Table 4-10 in section 4.4 for the configuration of P10.

4.2.15 Encoder Interface Unit Circuitry

The ADSP-21992 EZ-KIT Lite board allows you to apply differential encoder signals to the board at the encoder interface connector, P6. A differential line receiver, A8, is provided to convert the differential encoder signals to single-ended signals for the EIU inputs of the ADSP-21992. Three jumpers (JP28, JP29, JP30) are provided to enable this encoder interface circuitry. It is also possible to apply encoder signals directly to the encoder interface of the ADSP-21992 at these jumpers when they are open.

4.2.16 JTAG Emulation Port

The JTAG emulation port allows an emulator to access the DSP's internal and external memory, as well as the special function registers. See section 4.4.13 for more information about the JTAG connector. To learn more about available emulators, contact Analog Devices. See section 1.1 for information about contacting Analog Devices.

4.3   Jumper Settings

This section describes the function and configurations of the jumpers on the ADSP-21992 EZ-KIT Lite board. The following figure shows the location of all the jumpers (JP1 – JP31) on the ADSP-21992 EZ-KIT Lite board.
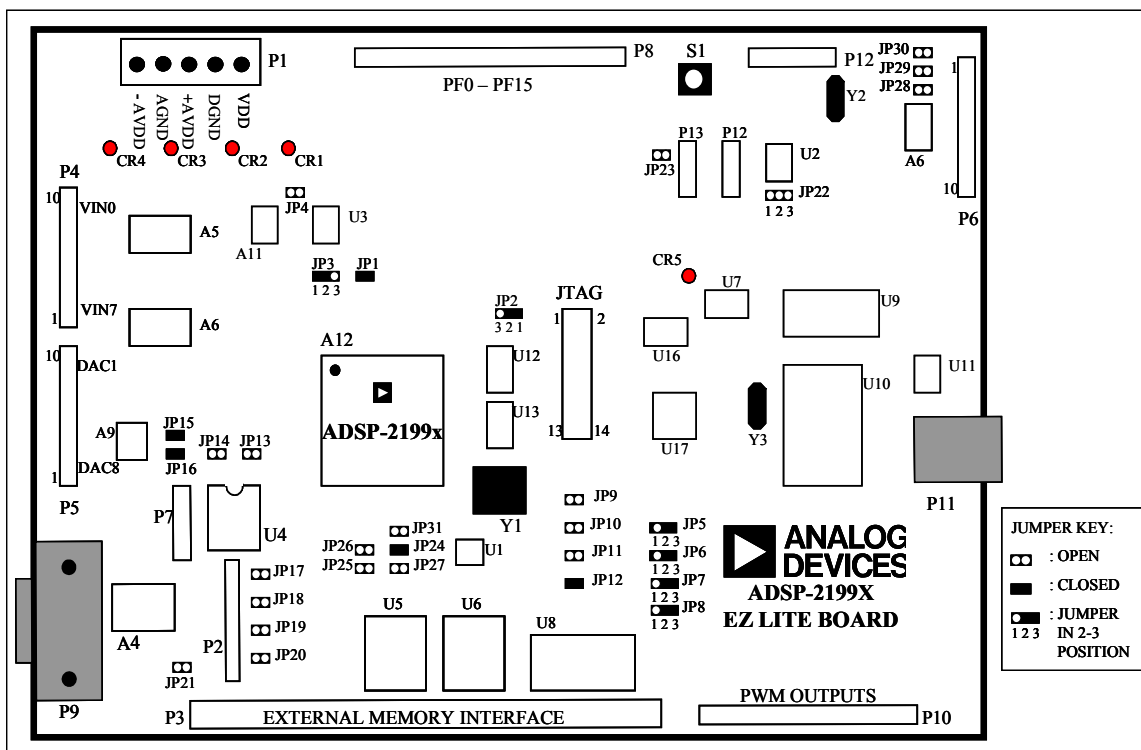
Figure 4-4: Jumpers Locations

4.3.1   List of Jumpers

Table 4-2 provides a list of jumpers on the ADSP-21992 EZ-KIT Lite board, including the initial jumper configuration when you receive the ADSP-21992 EZ-KIT Lite board.

Ref. Des.	Jumper Settings	Description
JP1	CLOSED	AGND / DGND Ground Link
JP2	1-2 Position	Choice of RESET
JP3	1-2 Position	Internal / External Vref Source
JP4	OPEN	Internal / External Vref Source
JP5	2-3 Position	Disable / Enable PWMTRIP
JP6	2-3 Position	PWM SR Mode Selection
JP7	2-3 Position	PWM Polarity Selection
JP8	2-3 Position	Disable / Enable AUXTRIP
JP9	OPEN	Boot Mode Selection
JP10	OPEN	Boot Mode Selection
JP11	OPEN	Boot Mode Selection
JP12	CLOSED	PLL BYPASS Mode
JP13	OPEN	SPI EEPROM Select
JP14	OPEN	SPI EEPROM Select
JP15	CLOSED	SPI DAC Select
JP16	CLOSED	SPI DAC Select
JP17	OPEN	TCLK0 / RCLK0 Connection
JP18	OPEN	RS-232 Circuit Jumper
JP19	OPEN	RS-232 Circuit Jumper
JP20	OPEN	RS-232 Circuit Jumper
JP21	OPEN	RS-232 Circuit Jumper
JP22	NO Shunt required	CAN Circuitry Jumper
JP23	OPEN	CAN Circuitry Jumper
JP24	CLOSED	External SRAM Memory IC Select
JP25	OPEN	External SRAM Memory IC Select
JP26	OPEN	External SRAM Memory IC Select
JP27	OPEN	External SRAM Memory IC Select
JP28	OPEN	Encoder Interface Circuitry Jumper
JP29	OPEN	Encoder Interface Circuitry Jumper
JP30	OPEN	Encoder Interface Circuitry Jumper
JP31	OPEN	External FLASH Memory IC Select

Table 4-2: Jumpers on the ADSP-21992 EZ-KIT Lite Board

4.3.2 Ground Plane Link, JP1

JP1 is a link that connects the analog and digital ground planes of the ADSP-21992 EZ-KIT Lite board.

NOTE: For correct operation, this link must not be removed.

4.3.3 External / Internal DSP Reset Selection Jumper, JP2

JP2 enables you to select the source of reset for the ADSP-21992. When JP2 is in the 1-2 position, the ADSP-21992 can be reset from 3 external sources: pushbutton switch (S1) the external power-on reset IC (ADM708), or through the USB interface circuitry on the ADSP-21992 EZ-KIT Lite board. If JP2 is in the 2-3 position, the power-on reset (POR) of the ADSP-21992 is directly connected to the reset pin of the ADSP-21992. The 1-2 position is the default and recommended configuration when using the VisualDSP++ development tools.

4.3.4 External/Internal Voltage Reference Selection Jumpers, JP3 and JP4

The configuration of two jumpers, JP3 and JP4, is required to control the selection of the ADSP-21992's internal voltage reference or the provided external voltage reference on the ADSP-21992 EZ-KIT Lite board. The appropriate settings for the jumpers to select internal or external voltage reference operation are:

INTERNAL Reference: JP3 in position 1-2, JP4 open
EXTERNAL Reference: JP3 in position 2-3, JP4 closed

Please see section 4.2.4 for more details on voltage reference operation.

4.3.5 PWM Trip Jumper, JP5

Connecting jumper JP5 in the 2-3 position ties the $\overline{\text{PWMTRIP}}$ pin of the ADSP-21992 to +3.3V via a 4.7KΩ resistor and enables the PWM outputs. In this case, the $\overline{\text{PWMTRIP}}$ pin of the ADSP-21992 can be defined by external circuitry via the PWM connector, P10. Alternatively, connecting jumper JP5 in the 1-2 position connects the $\overline{\text{PWMTRIP}}$ pin of the ADSP-21992 to GND, thereby permanently disabling the PWM outputs. A third alternative is to leave JP5 unconnected. Again, in this case, the $\overline{\text{PWMTRIP}}$ pin of the ADSP-21992 is connected to the PWM connector, P10, so that its value can be defined by external circuitry.

4.3.6 PWM Switched Reluctance Mode Jumper, JP6

Connecting JP36 in the 2-3 position ties the $\overline{\text{PWMSR}}$ pin of the ADSP-21992 to +3.3V and disables the PWM switched reluctance mode. Alternatively, connecting JP6 in the 1-2 position ties the $\overline{\text{PWMSR}}$ pin of the ADSP-21992 to GND and enables the PWM switched reluctance mode.

4.3.7 PWM Polarity Jumper, JP7

Connecting JP7 in the 2-3 position ties the PWMPOL pin of the ADSP-21992 to +3.3V and enables active HI PWM outputs. Alternatively, connecting JP7 in the 1-2 position creates active LO PWM outputs from the ADSP-21992. The appropriate setting for this jumper is determined by the exact nature of the gate drive circuit of the target system. A third alternative is to leave JP5 unconnected. In this case, its state can be determined by external hardware.

4.3.8 AUXPWM Trip Jumper, JP8

Connecting jumper JP8 in the 2-3 position ties the $\overline{\text{AUXTRIP}}$ pin of the ADSP-21992 to VDD and enables AUXPWM outputs. In this case, the $\overline{\text{AUXTRIP}}$ pin of the ADSP-21992 can be defined by external circuitry, via the PWM connector, P10. Alternatively, connecting jumper JP8 in the 1-2 position connects the $\overline{\text{AUXTRIP}}$ pin of the ADSP-21992 to GND, thereby permanently disabling AUXPWM outputs. A third alternative is to leave JP8 unconnected. Again, in this case, the $\overline{\text{AUXTRIP}}$ pin of the ADSP-21992 is connected to the PWM connector, P10, so that its value can be defined by external circuitry.

4.3.9 Boot Mode and Bypass Mode Select Jumpers, JP9–JP12

The ADSP-21992 supports different boot modes that are controlled by the three dedicated hardware boot mode control pins (BMODE2, BMODE1, and BMODE0). These modes can be selected by the configuration of the three 2-pin jumpers, JP9-JP11. The default setting for these three 2-pin jumpers is OPEN, whereby no boot mode is selected.

The DSP provides a user-programmable (1x to 32x) multiplication of the input clock, including fractional values, to support 128 external-to-internal (DSP core) clock ratios. The BYPASS pin, MSEL6–0, and DF bits in the PLL configuration register, specify the PLL multiplication factor at reset. When JP12 is CLOSED, BYPASS mode is selected (default).

4.3.10 SPI EEPROM Enable Jumpers, JP13 and JP14

A socket is available on the ADSP-21992 EZ-KIT Lite board for an 8-pin SPI Serial EEPROM, such as the Microchip 25LC640, which is used for booting and/or data storage. JP13 and JP14 are used to enable the SPI EEPROM. It is decoded at SPI slave select 1 via JP14. JP13 is used to enable/disable the write protection pin of the SPI EEPROM.

4.3.11 DAC Enable Jumpers, JP15 and JP16

JP13 and JP14 enable the 8-channel, serial, 12-bit DAC on the ADSP-21992 EZ-KIT Lite board. The DAC is decoded at SPI slave select 2, via JP15. PF3 is used to update the DAC register via JP16.

4.3.12 Serial Port / UART Circuitry Jumpers, JP17–JP21

Jumper JP17 connects the transmit clock of the serial port to the receive clock of the Serial port.

Jumpers JP18 – JP21 are used to configure the UART circuitry on the ADSP-21992 EZ-KIT Lite board. JP18–JP20 to enable the UART circuitry, and JP21 enables the required loopback in the UART circuitry.

4.3.13 External FLASH Memory Enable Jumper, JP31

Sockets are provided on the ADSP-21992 EZ-KIT Lite board to connect the External Memory Interface to two 512K x 8-bit flash memory ICs (U5, U6). These flash memory ICs are connected to the boot memory select ($\overline{BMS}$) pin, or to the memory select 0 pin ($\overline{MS0}$) via a 2-input AND gate. Jumper JP31 is placed on the $\overline{MS0}$ line to disconnect the $\overline{MS0}$ pin if required.

4.3.14 External SRAM Enable Jumpers, JP24 – JP27

A 64K by 16-bit SRAM IC (U8) is provided on the External Memory Interface (EMI) of the ADSP-21992 EZ-KIT Lite board. External memory space consists of four memory banks. The $\overline{MS3} - \overline{MS0}$ memory bank pins select banks 3-0, respectively. JP24 – JP27 map the external SRAM to $\overline{MS0}$, $\overline{MS1}$, $\overline{MS2}$, or $\overline{MS3}$.

NOTE: If using external SRAM, only **one** of these 2-pin jumpers should be CLOSED at any one time.

4.3.15 Encoder Interface Jumpers, JP28 – JP30

The ADSP-21992 EZ-KIT Lite board allows you to apply differential encoder signals to the board at the encoder interface connector (EIU), P6. A differential line receiver IC, A8, is provided to convert the differential encoder signals to single-ended signals for the EIU inputs of the ADSP-21992. Three 2-pin jumpers, JP28 – JP30, are provided to enable this encoder interface circuitry. It is also possible to apply encoder signals directly to the Encoder Interface of the ADSP-21992 at these jumpers, when they are OPEN (i.e., no shunt installed).

4.3.16 CAN Interface Jumpers, JP22 – JP23

A CAN transceiver (U2) is provided on the CAN interface. JP22 can enable (2-3 position) or disable (1-2 position) the sleep mode on the CAN transceiver. If no shunt is present, this mode can be defined by external circuitry. Connectors P12 and P13 provide connections to the user's CAN bus and allow easy daisy-chaining of CAN devices. CAN bus termination of 120Ω is provided by closing jumper JP23.

4.4 Connectors

This section describes the function of the connectors on the ADSP-21992 EZ-KIT Lite board. The following figure shows the locations of connectors, P1 – P13.
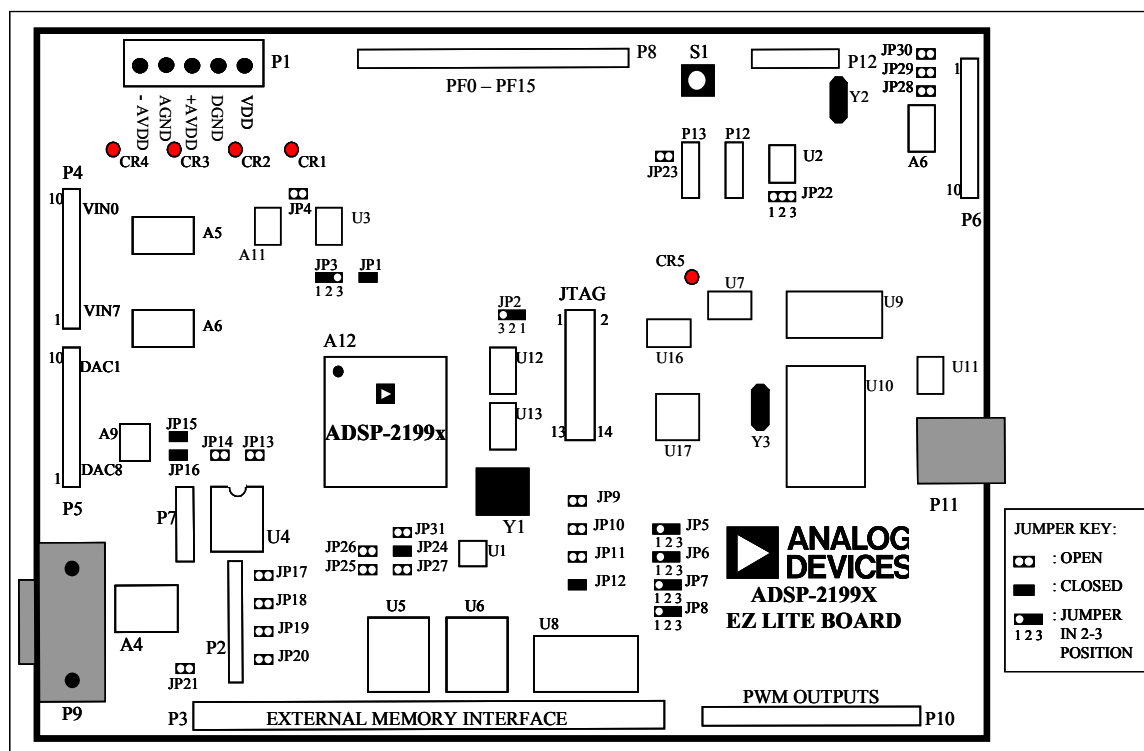

Figure 4-5: Connector Locations

4.4.1 Power Supply Connector, P1

Please refer to section 4.2.1 for details of the input power supply connector, P1.

4.4.2 Serial Port Connector, P2

The SPORT is connected to a 10-pin connector.

PIN	NAME	SIGNAL
1	+3.3V	Vddext
2	DR	Receive Data
3	DGND	Digital Ground
4	DT	Transmit Data
5	NC	No Connect
6	+3.3V	Vddext
7	TCLK0	Transmit Clock
8	TFS	Transmit Frame Sync
9	RFS	Receive Frame Sync
10	RCLK	Receive Clock

Table 4-3: SPORT Connector, P2

4.4.3 External Memory Interface (EMI) Connector, P3

Please refer to the schematics in APPENDIX A: SCHEMATICS, at the end of this document for the pin-out of the EMI connector.

4.4.4 Analog Inputs Connector, P4

Analog input signals to the ADSP-21992 EZ-KIT Lite board are supplied at the analog inputs connector (P4). Nominally, analog input signals in the range –1V to +1V may be applied to the ADSP-21992 EZ-KIT Lite board.

PIN	NAME	SIGNAL
1	AGND	Analog Ground
2	VIN0	Analog Input Channel 0
3	VIN1	Analog Input Channel 1
4	VIN2	Analog Input Channel 2
5	VIN3	Analog Input Channel 3
6	VIN4	Analog Input Channel 4
7	VIN5	Analog Input Channel 5
8	VIN6	Analog Input Channel 6
9	VIN7	Analog Input Channel 7
10	AGND	Analog Ground

Table 4-4: Analog Input Connector, P4

4.4.5 DAC Outputs Connector, P5

The outputs of the SPI DAC are brought out to the DAC outputs connector, P5.

PIN	NAME	SIGNAL
1	AGND	Analog Ground
2	DAC0	DAC Channel 0
3	DAC1	DAC Channel 1
4	DAC2	DAC Channel 2
5	DAC3	DAC Channel 3
6	DAC4	DAC Channel 4
7	DAC5	DAC Channel 5
8	DAC6	DAC Channel 6
9	DAC7	DAC Channel 7
10	AGND	Analog Ground

Table 4-5: DAC Outputs Connector, P5

4.4.6 Encoder Interface Connector, P6

Differential encoder signals can be applied to the ADSP-21992 EZ-KIT Lite board at the encoder interface connector, P6.

PIN	NAME	SIGNAL
1	DGND	Digital Ground
2	EIZ+	Differential North marker Z+
3	EIZ-	Differential North marker Z-
4	DGND	Digital Ground
5	EIB+	Differential Quadr. Pulse input B+
6	EIB-	Differential Quadr. Pulse input B-
7	DGND	Digital Ground
8	EIA+	Differential Quadr. Pulse input A+
9	EIA-	Differential Quadr. Pulse input A-
10	DGND	Digital Ground

Table 4-6: Encoder Interface Connector, P6

4.4.7 SPI Connector, P7

The SPI signals are made available at the SPI connector, P7.

PIN	NAME	SIGNAL
1	DGND	Digital Ground
2	SCK	Clock
3	MISO	Master In Slave Out
4	MOSI	Master Out Slave In
5	DGND	Digital Ground
6	DGND	Digital Ground

Table 4-7: SPI Connector, P7

4.4.8 Programmable Flag Interface Connector, P8

All programmable flag pins and the external ADC conversion start pin are available on the programmable flag interface connector, P8.

PIN	NAME	SIGNAL
1	+3.3V	Vddext
2	PF0	Programmable Flag 0
3	PF1	Programmable Flag 1
4	PF2	Programmable Flag 2
5	PF3	Programmable Flag 3
6	PF4	Programmable Flag 4
7	PF5	Programmable Flag 5
8	PF6	Programmable Flag 6
9	PF7	Programmable Flag 7
10	DGND	Digital Ground
11	PF8	Programmable Flag 8
12	PF9	Programmable Flag 9
13	PF10	Programmable Flag 10
14	PF11	Programmable Flag 11
15	PF12	Programmable Flag 12
16	PF13	Programmable Flag 13
17	PF14	Programmable Flag 14
18	PF15	Programmable Flag 15
19	CONVST	ADC external convert start
20	DGND	Digital Ground

Table 4-8: Programmable Flag Interface Connector, P8

4.4.9 UART (RS-232) Interface Connector, P9

A standard female RS-232, D-sub, 9-pin connector is used for the UART interface circuitry on the ADSP-21992 EZ-KIT Lite board.

PIN	NAME	SIGNAL
1	1-4-6	
2	T1O	Transmit
3	R1E	Receive
4	1-4-6	
5	DGND	Digital Ground
6	1-4-6	
7	RTS	
8	CTS	
9	NC	Not Connected

Table 4-9: UART (RS-232) Interface Connector, P9

4.4.10 PWM, AUXPWM, Timer Interface Connector, P10

The PWM, AUXPWM, and general-purpose timer signals are available on P10.

PIN	NAME	SIGNAL
1	AH	PWM Channel A High Output
2	AL	PWM Channel A Low Output
3	BH	PWM Channel B High Output
4	BL	PWM Channel B Low Output
5	CH	PWM Channel C High Output
6	CL	PWM Channel C Low Output
7	$\overline{\text{PWMTRIP}}$	PWM Trip Input
8	PWMSYNC	PWM Synchronization Signal
9	DGND	Digital Ground
10	AUX0	Auxiliary PWM Output
11	AUX1	Auxiliary PWM Output
12	DGND	Digital Ground
13	$\overline{\text{AUXTRIP}}$	Auxiliary PWM Trip Input
14	TMR0	General-Purpose Timer I/O
15	TMR1	General-Purpose Timer I/O
16	TMR2	General-Purpose Timer I/O

Table 4-10: PWM, AUX, TMR Interface Connector, P10

4.4.11 USB Connector, P11

The USB connector is a standard type B USB receptacle.

Part Description	Manufacturer	Part Number
Type B USB receptacle	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

4.4.12 CAN Interface Connector, P12–P13

There are two connectors associated with the CAN interface circuitry on the ADSP-21992 EZ-KIT Lite board. Connectors P12 and P13 provide connections to the user's CAN bus and allow easy daisy-chaining of CAN devices.

PIN	NAME	SIGNAL
1	DGND	Digital Ground
2	CANL	CAN Receive
3	CANH	CAN Transmit
4	+3.3V	Vddext

Table 4-11: CAN Interface Connectors, P12 and P13

4.4.13 JTAG Connector

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

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

When an emulator is connected to the JTAG header, the USB debug interface is disabled.

> ➢ **WARNING: When using an emulator with the EZ-KIT Lite board, follow the connection instructions provided with the emulator.**

4.5   Mechanical Dimensions

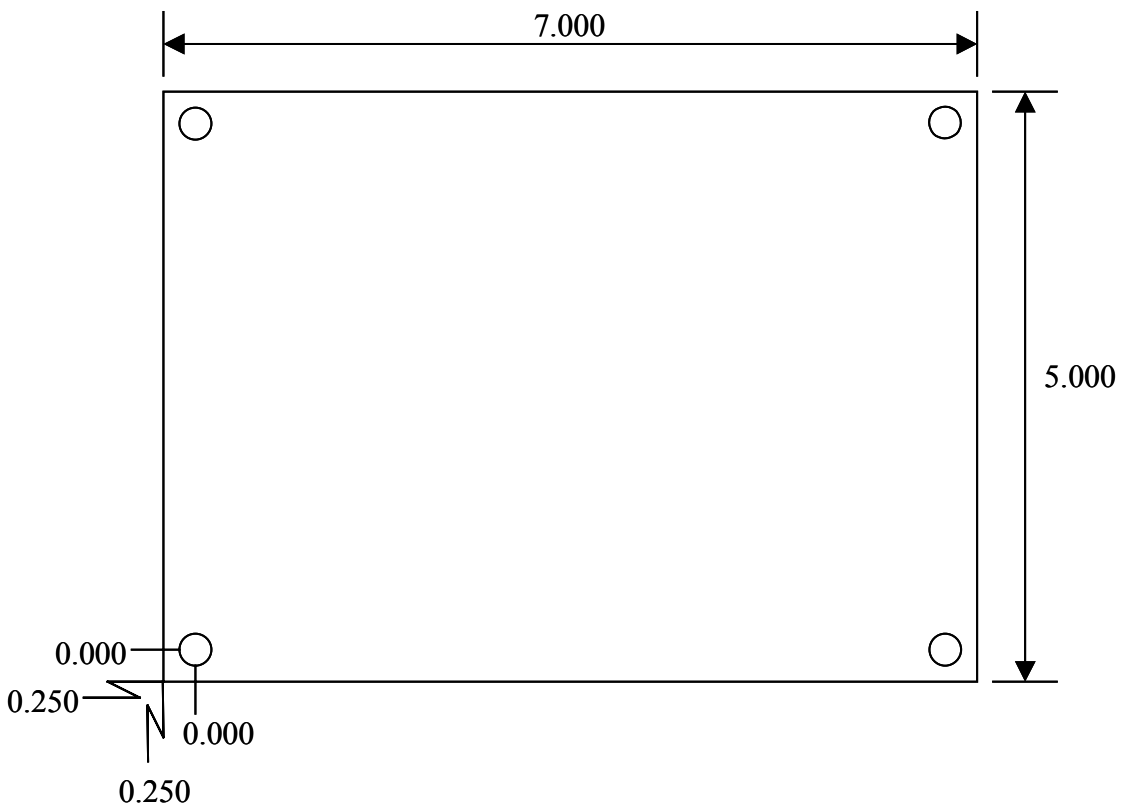Figure 4-6 shows the dimensions of the board.

Figure 4-6: Mechanical Dimensions (Measurements are in Inches)

APPENDIX A: SCHEMATICS

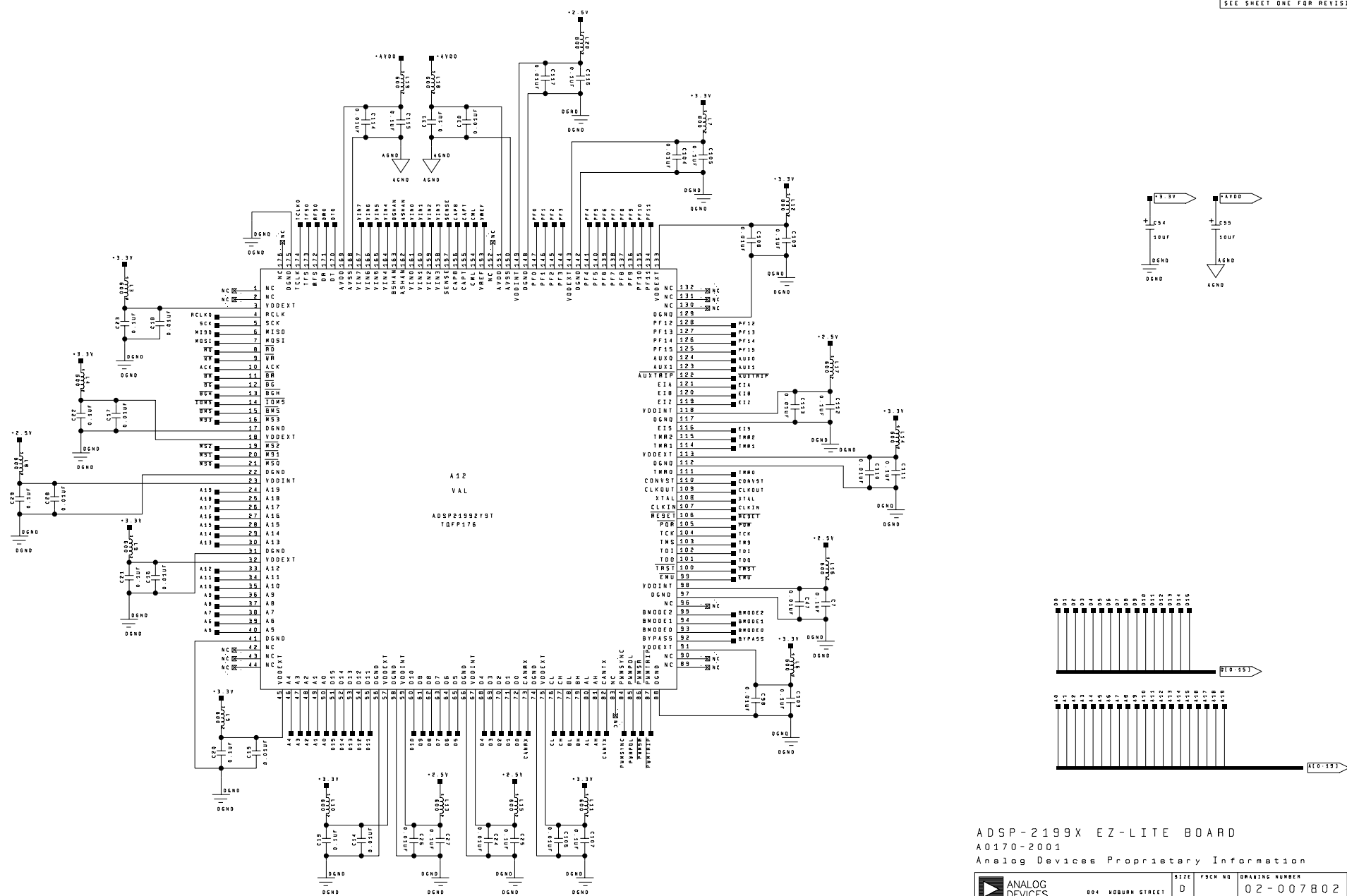The schematics for the ADSP-21992 EZ-KIT Lite board are available on the next 10 pages.

D

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ORIGINATION		
	UPDATES TO SCHEMATIC TEMPLATE	9/00	

C

NOTE:

THIS TEMPLATE COMPLIES WITH WILMINGTON
ANALOG DEVICES CONFIGURATION.

B

PART NO	DESCRIPTION		REF DES		NOTES
HIGHEST REF DES USED					

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

TOLERANCES
DECIMALS   FRACTIONS   ANGLES
.XX +-.010   +-1/32   +-2
.XXX +-.005

SCHEMATIC

ANALOG
DEVICES

804 WOBURN ST
WILMINGTON, MA 01887

APPROVAL	DATE	TITLE
		ADSP-2199X EZ-LITE BOARD
MATERIAL		DRAWN BY: S. FRANCIS 9/02
		DESIGNED BY:
REF DES NOT USED		CHECKED:

A0170-2001

FINISH	APPROVED BY:	SIZE	FSCM NO	DRAWING NUMBER	REV
	MFG ENGINEER:	B		02-008057	B
DO NOT SCALE		SCALE NONE		SHEET 1 OF 10	

ADSP-2199X EZ-LITE BOARD
A0170-2001
Analog Devices Proprietary Information
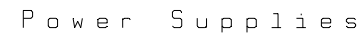
ANALOG DEVICES
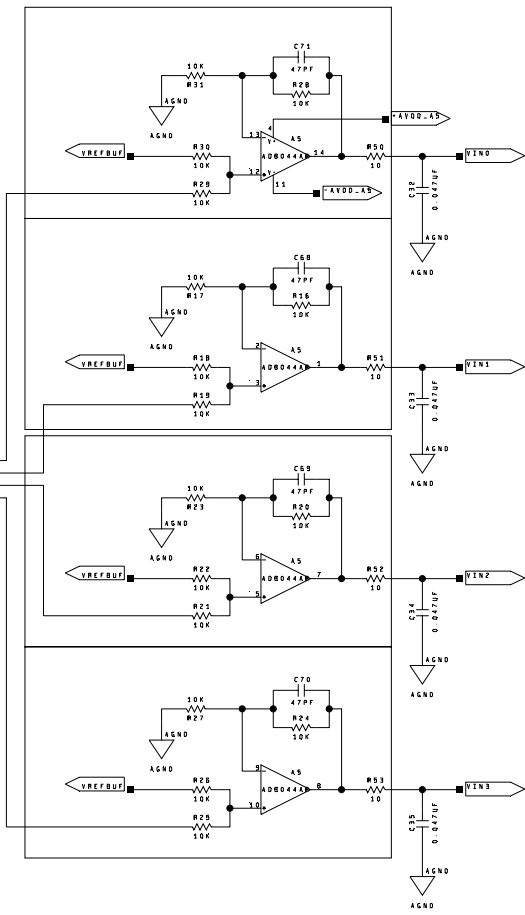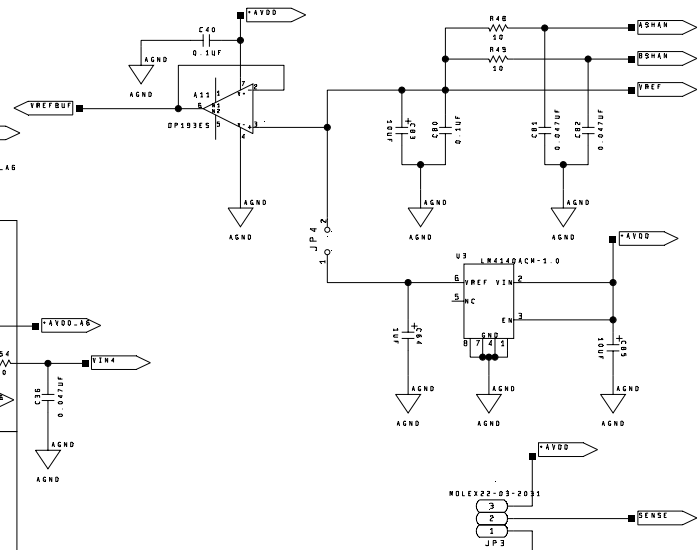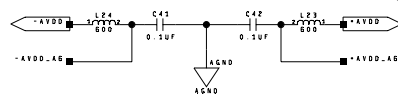804 WOBURN STREET
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SIZE D

DRAWING NUMBER
02-007802

REV B

DRAWN BY S.FRANCIS
SCALE NONE
DO NOT SCALE
SHEET 2 OF 10

SEE SHEET ONE FOR REVISIONS

ADSP21992YST
TQFP176

A1
ADP3338AKC-2.5
IN   OUT
GND   NC

A2
ADP3338AKC-3.3
IN   OUT
GND   NC

A3
ADP3338AKC-2.5
IN   OUT
GND   NC

LM337LM

DGND
DGND

LUMBERGKRM2
P1
VDD   1
DGNDSUPPLY 2

P1A
+AVDDSUPPLY 1
AGNDSUPPLY 2
-AVDDSUPPLY 3
LUMBERGKRM3

R93
0   +2.5V

R94
0   +3.3V

R95
0   +AVDD

R96
0   -AVDD

R1 30%   CR1 RED
R2 30%   CR2 RED
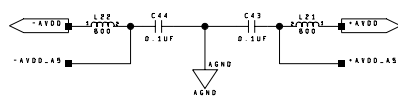R3 30%   CR3 RED
R4 30%   CR4 RED

JP1
AGND   DGND

Power Supplies

ANALOG
DEVICES
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SHEET 3 OF 10

Reset

Oscillator Circuitry

NOTE: SOCKET

Boot Mode Selection & PLL Bypass

ANALOG
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Analog Signal Conditioning
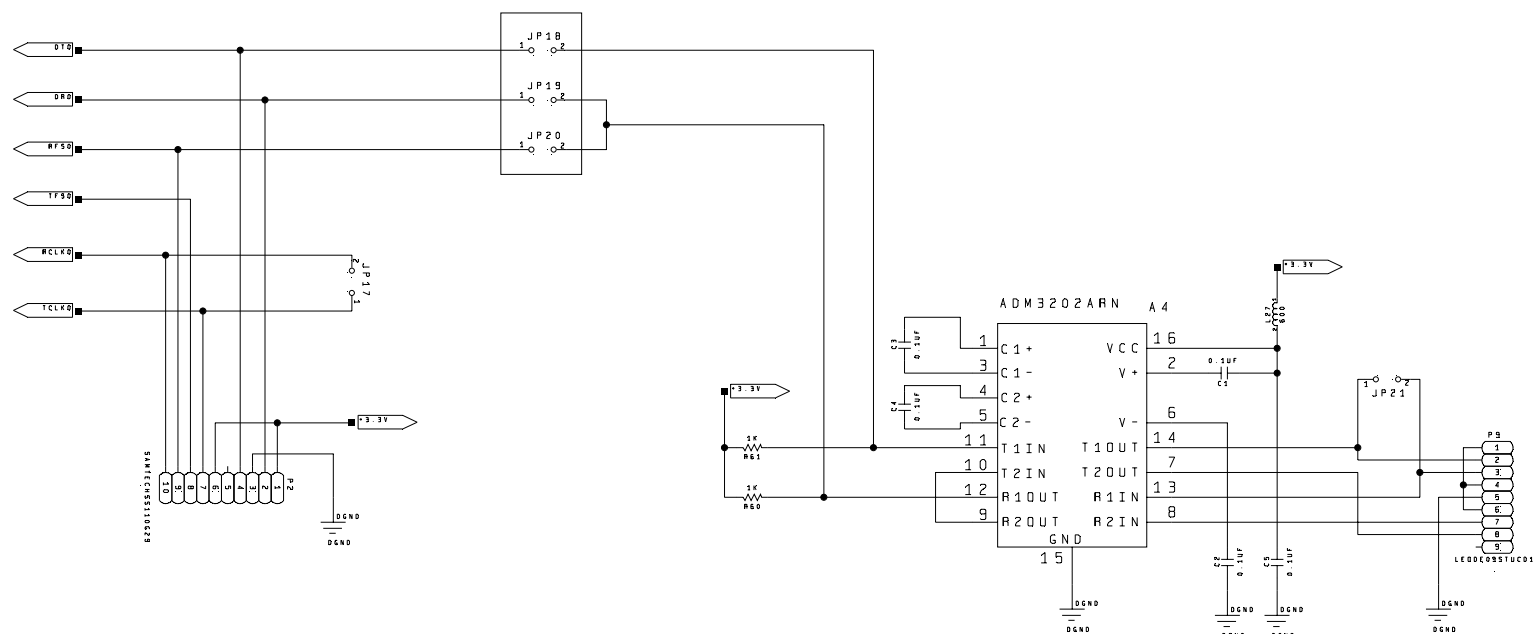
Reference Voltage

ADSP-2199X EZ-LITE BOARD
A0170-2001
Analog Devices Proprietary Information

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DEVICES

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SIZE F9CM NO | DRAWING NUMBER | REV
D | | 02-007802 | B

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SCALE   NONE   DO NOT SCALE   SHEET 9 OF 10

SCK

MISO

MOSI

PF1

PF2

PF3

JP15
1 2

JP16
1 2

+3.3V

JP14
1 2

R31
4.75K

+3.3V

+3.3V

JP13
1 2

U4

1 CS
2 SO
3 WP
4 VSS

VCC 8
HOLD 7
SCK 6
SI 5

25AA640IP

10K
R59

RESET

C45
0.1uF

DGND

DGND

R58
10K

DGND

DGND

P7

DGND

DGND

SPI EEPROM

+AVDD

C46
0.1uF

AGND

A9

16 SCLK   LDAC 1
15 DIN   SYNC 2
14 GND   VDD 3
13 VOUTH   VOUTA 4
12 VOUTG   VOUTB 5
11 VOUTF   VOUTC 6
10 VOUTE   VOUTD 7
9 VREF2   VREF1 8

AD5328BRU

AGND

AGND

VREFBUF

P5

1
2
3
4
5
6
7
8
9
10

SAMTECHSS110G29

AGND

AGND

AGND

AGND

DAC CIRCUITRY

ADSP-2199X EZ-LITE BOARD
A0170-2001
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DEVICES

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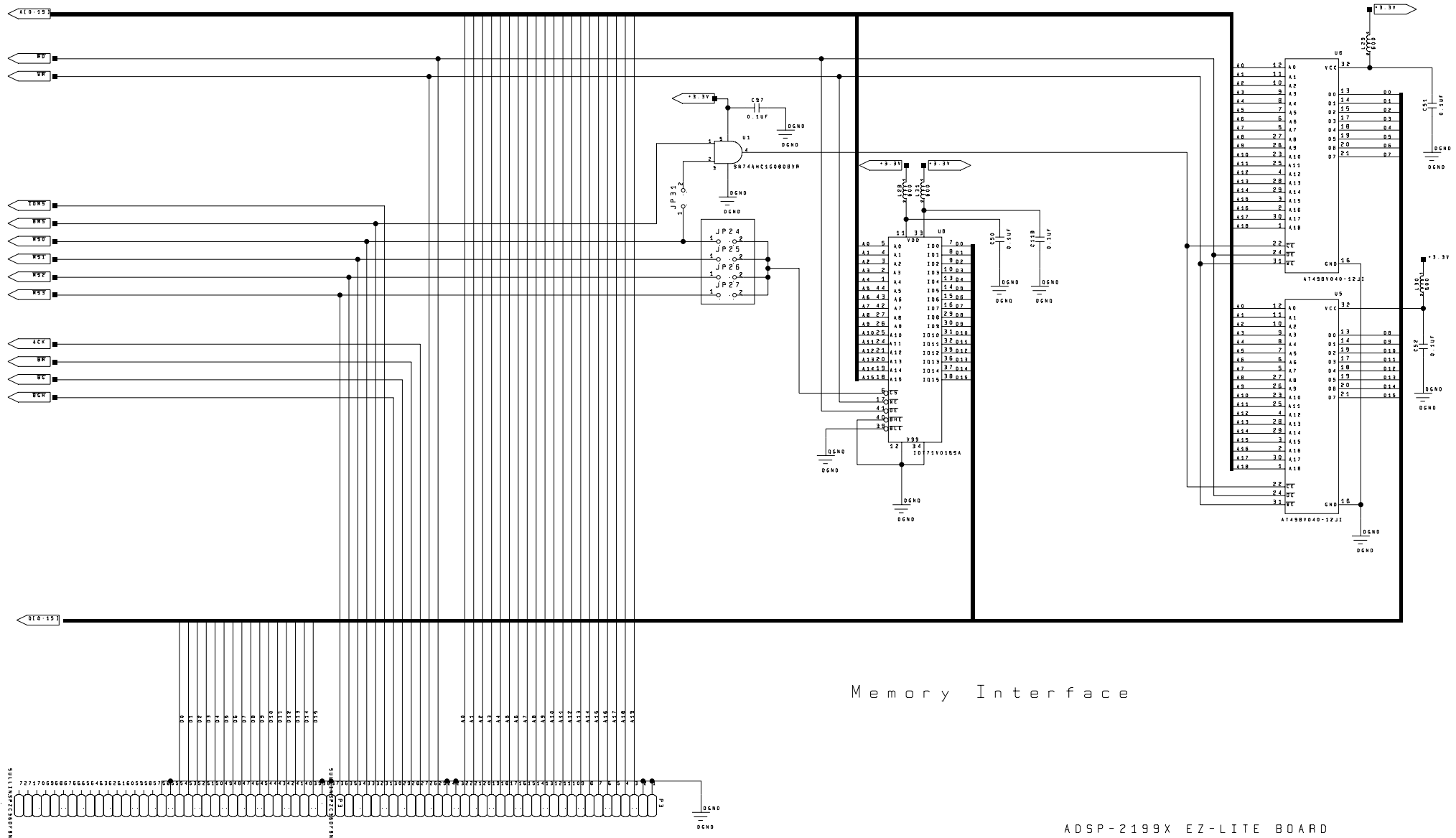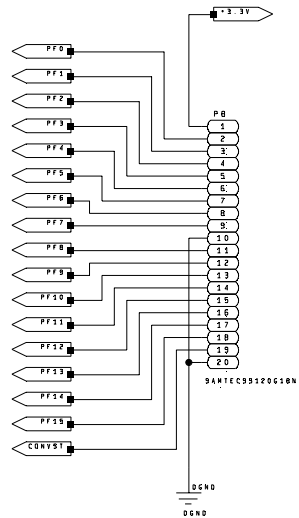
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DO NOT SCALE

SHEET 6 OF 10

SPORT Interface

JP18
1 2

JP19
1 2

JP20
1 2

DT0
DR0
RFS0
TFS0
RCLK0
TCLK0

JP17
2
1

+3.3V

SAMTEC HSS1 10629
10 9 8 7 6 5 4 3 2 1
P2

DGND
DGND

UART Interface

ADM3202ARN   A4

1 C1+   VCC 16
3 C1-   V+   2
4 C2+   V-   6
5 C2-
11 T1IN   T1OUT 14
10 T2IN   T2OUT 7
12 R1OUT   R1IN 13
9 R2OUT   R2IN 8
       GND
        15

C3 0.1UF
C4 0.1UF
0.1UF C1

+3.3V

1K R61
1K R60

+3.3V

JP21
1 2

P9
1
2
3
4
5
6
7
8
9

LEDC0SSTUC01

DGND
DGND DGND DGND DGND

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Memory Interface

SN74AHC1G0808YR

AT49BV040-12JI

AT49BV040-12JI

IDT71V0165A

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General Purpose I/O

CAN Interface

PWM Interface

EIU circuitry

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SEE SHEET ONE FOR REVISIONS

Index