ADSP-BF535 EZ-KIT Lite®
Evaluation System Manual

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

ANALOG DEVICES

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Printed in the USA.

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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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Regulatory Compliance

The ADSP-BF535 EZ-KIT Lite evaluation system has been certified to comply with the essential requirements of the European EMC directive 89/336/EEC (inclusive 93/68/EEC) and, therefore, carries the "**CE**" mark.

The ADSP-BF535 EZ-KIT Lite evaluation system had been appended to Analog Devices Development Tools Technical Construction File referenced "DSPTOOLS1" dated December 21, 1997 and was awarded CE Certification by an appointed European Competent Body and is on file.

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

CONTENTS

PREFACE

PREFACE

Thank you for purchasing the ADSP-BF535 EZ-KIT Lite®, Analog Devices, Inc. evaluation system for Blackfin® processors.

The Blackfin processors are embedded processors that support a Media Instruction Set Computing (MISC) architecture. This architecture is the natural merging of RISC, media functions, and digital signal processing (DSP) characteristics towards delivering signal processing performance in a microprocessor-like environment.

The evaluation board is designed to be used in conjunction with the VisualDSP++® development environment to test the capabilities of the ADSP-BF535 (formerly ADSP-21535) Blackfin processors. The VisualDSP++ development environment gives you the ability to perform advanced application code development and debug, such as:

- Create, compile, assemble, and link application programs written in C++, C and ADSP-BF535 assembly
- Load, run, step, halt, and set breakpoints in application program
- Read and write data and program memory
- Read and write core and peripheral registers
- Plot memory

Access to the ADSP-BF535 processor from a personal computer (PC) is achieved through a USB port or an optional JTAG emulator. The USB interface gives unrestricted access to the ADSP-BF535 processor and the evaluation board peripherals. Analog Devices JTAG emulators offer faster

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

ADSP-BF535 EZ-KIT Lite provides example programs to demonstrate the capabilities of the evaluation board.

The ADSP-BF535 EZ-KIT Lite installation is part of the VisualDSP++ installation. The EZ-KIT Lite is a licensed product that offers an unrestricted evaluation license for the first 90 days. For details about evaluation license restrictions after the 90 days, refer to "Evaluation License Restrictions" on page 1-7 and the *VisualDSP++ Installation Quick Reference Card*.

The board's features include:

- Analog Devices ADSP-BF535 processor
  - 300 MHz core clock speed (default)
  - Switch-configurable core clock speed
  - Switch-configurable boot mode
- USB debugging interface

This is not the processor's USB interface.

- Analog Devices AD1885 48 kHz AC'97 SoundMAX® codec
  - Jumper-selectable line-in or mic-in 3.5 mm stereo jack
  - Line-out 3.5 mm stereo jack
- Synchronous dynamic random access memory (SDRAM)
  - 4 M x 32-bit
- Flash memory
  - 272 K x 16

- Interface connectors
  - 14-pin emulator connector for JTAG interface
  - SPORT0 connector
  - FlashLINK™ connector (for flash memory programming)
  - Expansion interface connectors (not populated)
- General-purpose IO
  - 4 push buttons connected to processor programmable flags
  - 1 push button connected to processor non-maskable interrupt
  - 4 LEDs connected to processor programmable flags
- Real-time clock
- Analog Devices ADP3331, ADP3338, ADP3339, and ADP3088 voltage regulators

The EZ-KIT Lite board has a flash memory device that can be used to store user-specific boot code. By configuring the boot mode switch (SW1) and by programming the flash memory, the board can run as a stand-alone unit. For information about the flash memory, see "Flash Memory" on page 1-9.

SPORT0 interfaces with an audio codec to aid development of audio signal processing applications. SPORT0 also connects to an off-board connector for communication with other serial devices. For information about SPORT0, see "SPORT0 Audio Interface" on page 2-3.

Additionally, the EZ-KIT Lite board provides access to most peripheral ports of the processor. Access is provided in the form of uninstalled expansion interface connectors. The processor's USB pins are brought to the P3 connector but require additional circuitry to function as a USB port. The PCI bus of the processor is not available at any connector of the EZ-KIT Lite. For information about the expansion interface, see "Expansion Interface" on page 2-4.

Purpose of This Manual

The *ADSP-BF535 EZ-KIT Lite Evaluation System Manual* provides instructions for installing the product hardware (board). The text describes the operation and configuration of the board components and provides guidelines for running your own code on the ADSP-BF535 EZ-KIT Lite. Finally, a schematic and a bill of materials are provided as a reference for future designs.

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

Intended Audience

The primary audience for this manual is a programmer who is familiar with Analog Devices processors. This manual assumes that the audience has a working knowledge of the appropriate processor architecture and instruction set. Programmers who are unfamiliar with Analog Devices processors can use this manual but should supplement it with other texts (such as the *ADSP-BF535 Processor Hardware Reference* and the *Blackfin Processor Instruction Set Reference*) that describe your target architecture.

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

Manual Contents

The manual consists of:

- Chapter 1, "Using ADSP-BF535 EZ-KIT Lite" on page 1-1
  Describes the EZ-KIT Lite functionality from a programmer's perspective and provides an easy-to-access memory map.
- Chapter 2, "ADSP-BF535 EZ-KIT Lite Hardware Reference" on page 2-1
  Provides information on the EZ-KIT Lite hardware components.
- Appendix A, "ADSP-BF535 EZ-KIT Lite Bill Of Materials" on page A-1
  Provides a list of components used to manufacture the EZ-KIT Lite board.
- Appendix B, "ADSP-BF535 EZ-KIT Lite Schematic" on page B-1
  Provides the resources to allow EZ-KIT Lite board-level debugging or to use as a reference design.
  Appendix B now is part of the online Help. The PDF version of the *ADSP-BF535 EZ-KIT Lite Evaluation System Manual* located is in the `Docs\EZ-KIT Lite Manuals` folder on the installation CD. Alternatively, the schematics can be found on the Analog Devices Web site, `www.analog.com/processors`.

What's New in This Manual

This revision of the *ADSP-BF535 EZ-KIT Lite Evaluation System Manual* has been updated for VisualDSP++ 4.5.

Technical or Customer Support

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

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

Supported Processors

This EZ-KIT Lite evaluation system supports the Analog Devices ADSP-BF535 (formerly ADSP-21535) Blackfin processors.

Product Information

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

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

MyAnalog.com

MyAnalog.com is a free feature of the Analog Devices Web site that allows customization of a Web page to display only the latest information on products you are interested in. You can also choose to receive weekly e-mail notifications containing updates to the Web pages that meet your interests. MyAnalog.com provides access to books, application notes, data sheets, code examples, and more.

Registration:

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

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

Processor Product Information

For information on embedded processors and DSPs, visit our Web site at www.analog.com/processors, which provides access to technical publications, data sheets, application notes, product overviews, and product announcements.

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

- E-mail questions or requests for information to
  processor.support@analog.com (World wide support)
  processor.europe@analog.com (Europe support)
  processor.china@analog.com (China support)
- Fax questions or requests for information to
  1-781-461-3010 (North America)
  +49-89-76903-157 (Europe)

Related Documents

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

Table 1. Related Processor Publications

Title	Description
ADSP-BF535 Embedded Processor Datasheet	General functional description, pinout, and timing
ADSP-BF535 Blackfin Processor Hardware Reference	Description of internal processor architecture and all register functions
Blackfin Processor Instruction Set Reference	Description of all allowed processor assembly instructions

Table 2. Related VisualDSP++ Publications

Title	Description
VisualDSP++ User's Guide	Description of VisualDSP++ features and usage
VisualDSP++ Assembler and Preprocessor Manual	Description of the assembler function and commands
VisualDSP++ C/C++ Complier and Library Manual for Blackfin Processors	Description of the complier function and commands for Blackfin processors

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

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

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

All documentation is available online. Most documentation is available in printed form.

Visit the Technical Library Web site to access all processor and tools manuals and data sheets:
`http://www.analog.com/processors/resources/technicalLibrary`.

Online Technical Documentation

Online documentation comprises the VisualDSP++ Help system, software tools manuals, hardware tools manuals, processor manuals, the Dinkum Abridged C++ library, and Flexible License Manager (FlexLM) network license manager software documentation. You can easily search across the entire VisualDSP++ documentation set for any topic of interest. For easy printing, supplementary `.pdf` files of most manuals are provided in the `Docs` folder on the VisualDSP++ installation CD.

Each documentation file type is described as follows.

File	Description
`.chm`	Help system files and manuals in Help format
`.htm` or `.html`	Dinkum Abridged C++ library and FlexLM network license manager software documentation. Viewing and printing the `.html` files requires a browser, such as Internet Explorer 5.01 (or higher).
`.pdf`	VisualDSP++ and processor manuals in Portable Documentation Format (PDF). Viewing and printing the `.pdf` files requires a PDF reader, such as Adobe Acrobat Reader (4.0 or higher).

If documentation is not installed on your system as part of the software installation, you can add it from the VisualDSP++ CD at any time by running the Tools installation. Access the online documentation from the VisualDSP++ environment, Windows® Explorer, or the Analog Devices Web site.

Accessing Documentation From VisualDSP++

To view VisualDSP++ Help, click on the **Help** menu item or go to the Windows task bar and navigate to the VisualDSP++ documentation via the **Start** menu.

To view ADSP-BF535 EZ-KIT Lite Help, which is part of the VisualDSP++ Help system, use the **Contents** or **Search** tab of the Help window.

Accessing Documentation From Windows

In addition to any shortcuts you may have constructed, there are many ways to open VisualDSP++ online Help or the supplementary documentation from Windows.

Help system files (.chm) are located in the Help folder, and .pdf files are located in the Docs folder of your VisualDSP++ installation CD. The Docs folder also contains the Dinkum Abridged C++ library and the FlexLM network license manager software documentation.

Your software installation kit includes online Help as part of the Windows® interface. These help files provide information about VisualDSP++ and the ADSP-BF535 EZ-KIT Lite evaluation system.

Accessing Documentation From Web

Download manuals at the following Web site: http://www.analog.com/processors/resources/technicalLibrary/manuals.

Select a processor family and book title. Download archive (.zip) files, one for each manual. Use any archive management software, such as WinZip, to decompress downloaded files.

Printed Manuals

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

VisualDSP++ Documentation Set

To purchase VisualDSP++ manuals, call **1-603-883-2430**. The manuals may be purchased only as a kit.

If you do not have an account with Analog Devices, you are referred to Analog Devices distributors. For information on our distributors, log onto http://www.analog.com/salesdir/continent.asp.

Hardware Tools Manuals

To purchase EZ-KIT Lite and in-circuit emulator (ICE) manuals, call **1-603-883-2430**. The manuals may be ordered by title or by product number located on the back cover of each manual.

Processor Manuals

Hardware reference and instruction set reference manuals may be ordered through the Literature Center at **1-800-ANALOGD** (**1-800-262-5643**), or downloaded from the Analog Devices Web site. Manuals may be ordered by title or by product number located on the back cover of each manual.

Data Sheets

All data sheets (preliminary and production) may be downloaded from the Analog Devices Web site. Only production (final) data sheets (Rev. 0, A, B, C, and so on) can be obtained from the Literature Center at **1-800-ANALOGD** (**1-800-262-5643**); they also can be downloaded from the Web site.

To have a data sheet faxed to you, call the Analog Devices Faxback System at **1-800-446-6212**. Follow the prompts and a list of data sheet code numbers will be faxed to you. If the data sheet you want is not listed, check for it on the Web site.

Notation Conventions

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

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

Example	Description
Close command (**File** menu)	Titles in reference sections indicate the location of an item within the VisualDSP++ environment's menu system (for example, the **Close** command appears on the **File** menu).
`{this | that}`	Alternative required items in syntax descriptions appear within curly brackets and separated by vertical bars; read the example as `this` or `that`. One or the other is required.
`[this | that]`	Optional items in syntax descriptions appear within brackets and separated by vertical bars; read the example as an optional `this` or `that`.
`[this,…]`	Optional item lists in syntax descriptions appear within brackets delimited by commas and terminated with an ellipse; read the example as an optional comma-separated list of `this`.
`.SECTION`	Commands, directives, keywords, and feature names are in text with `letter gothic` font.
`filename`	Non-keyword placeholders appear in text with italic style format.
	**Note:** For correct operation, ... A Note provides supplementary information on a related topic. In the online version of this book, the word **Note** appears instead of this symbol.
	**Caution:** Incorrect device operation may result if ... **Caution:** Device damage may result if ... A Caution identifies conditions or inappropriate usage of the product that could lead to undesirable results or product damage. In the online version of this book, the word **Caution** appears instead of this symbol.
	**Warning:** Injury to device users may result if ... A Warning identifies conditions or inappropriate usage of the product that could lead to conditions that are potentially hazardous for the devices users. In the online version of this book, the word **Warning** appears instead of this symbol.

1 USING ADSP-BF535 EZ-KIT LITE

This chapter provides specific information to assist you with development of programs for the ADSP-BF535 EZ-KIT Lite evaluation system.

- "Example Programs" on page 1-13
  Provides information about the example programs included in the ADSP-BF535 EZ-KIT Lite evaluation system.
- "Flash Programmer Utility" on page 1-13
  Provides information on the Flash Programmer utility included with the EZ-KIT Lite software.
- "Background Telemetry Channel" on page 1-13
  Highlights the advantages of the Background Telemetry Channel.

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

For more detailed information about programming the ADSP-BF535 Blackfin processor, see the documents referred to as "Related Documents".

Package Contents

Your ADSP-BF535 EZ-KIT Lite evaluation system package contains the following items.

- ADSP-BF535 EZ-KIT Lite board
- *VisualDSP++ Installation Quick Reference Card*
- CD containing:
  - VisualDSP++ software
  - ADSP-BF535 EZ-KIT Lite software
  - USB driver files
  - Example programs
  - ADSP-BF535 *EZ-KIT Lite Evaluation System Manual* (this document)

- Universal 7.5V DC power supply
- USB 2.0 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.

Default Configuration

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

The ADSP-BF535 EZ-KIT Lite board is designed to run outside your personal computer as a stand-alone unit. You do not have to open your computer case.

When removing the EZ-KIT Lite board from the package, handle the board carefully to avoid the discharge of static electricity, which may damage the board components. Figure 1-1 shows the default jumper settings, switches, connector locations, and LEDs used in installation. Confirm that your board is set up in the default configuration before powering the board.

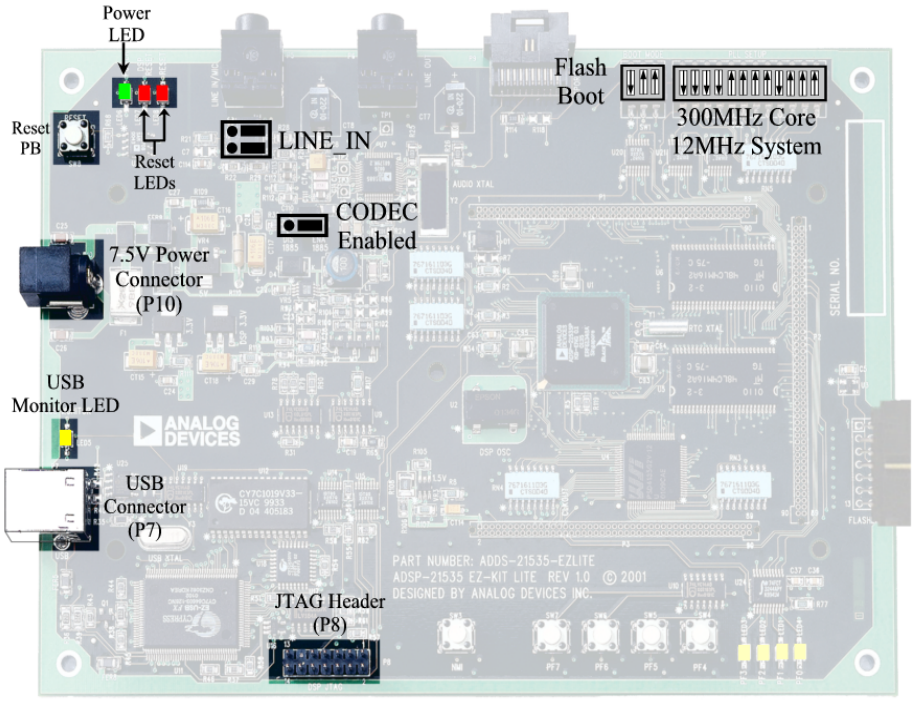


Figure 1-1. EZ-KIT Lite Hardware Setup

Installation and Session Startup

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

1. Verify that the yellow USB monitor LED (LED5, located near the USB connector) is lit. This signifies that the board is communicating properly with the host PC and is ready to run VisualDSP++.
2. If you are running VisualDSP++ for the first time, navigate to the VisualDSP++ environment via the **Start** –> **Programs** menu. The main window appears. Note that VisualDSP++ does not connect to any session. Skip the rest of this step to step 3.

   If you have run VisualDSP++ previously, the last opened session appears on the screen. You can override the default behavior and force VisualDSP++ to start a new session by pressing and holding down the **Ctrl** key while starting VisualDSP++. Do not release the **Ctrl** key until the **Session Wizard** appears on the screen. Go to step 4.
3. To connect to a new EZ-KIT Lite session, start **Session Wizard** by selecting one of the following.
   - From the **Session** menu, **New Session**.
   - From the **Session** menu, **Session List**. Then click **New Session** from the **Session List** dialog box.
   - From the **Session** menu, **Connect to Target**. Then click **New Session** from the **Session List** dialog box.
4. The **Select Processor** page of the wizard appears on the screen. Ensure **Blackfin** is selected in **Processor family**. In **Choose a target processor**, select **ADSP-BF535**. Click **Next**.

5. The **Select Connection Type** page of the wizard appears on the screen. Select **EZ-KIT Lite** and click **Next**.
6. The **Select Platform** page of the wizard appears on the screen. In the **Select your platform** list, select **ADSP-BF535 EZ-KIT Lite via Debug Agent**. In **Session name**, highlight or specify the session name.

   The session name can be a string of any length; although, the box displays approximately 32 characters. The session name can include space characters. If you do not specify a session name, VisualDSP++ creates a session name by combining the name of the selected platform with the selected processor. The only way to change a session name later is to delete the session and to open a new session.

   Click **Next**.
7. The **Finish** page of the wizard appears on the screen. The page displays your selections. If you are satisfied, click **Finish**. If not, click **Back** to make changes.

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

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

Evaluation License Restrictions

The ADSP-BF535 EZ-KIT Lite installation is part of the VisualDSP++ installation. The EZ-KIT Lite is a licensed product that offers an unrestricted evaluation license for the first 90 days. Once the initial unrestricted 90-day evaluation license expires:

- VisualDSP++ allows a connection to the ADSP-BF535 EZ-KIT Lite via the USB Debug Agent interface only. Connections to simulators and emulation products are no longer allowed.
- The linker restricts a users program to 176 KB of internal memory for code space with no restrictions for data space.

The EZ-KIT Lite hardware must be connected and powered up in order to use VisualDSP++ with a valid temporary or demo license.

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

Memory Map

The ADSP-BF535 processor has internal SRAM that can be used for instruction or data storage. The configuration of internal SRAM is detailed in the *ADSP-BF535 Processor Hardware Reference*.

The ADSP-BF535 EZ-KIT Lite board contains 272K x 16 bits of external flash memory. This memory connects to the ~AMS0 memory select pin of the processor. The external memory also connects to 4M x 32-bit SDRAM memory. This memory connects to the ~SMS0 pin of the processor.

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

Start Address		End Address	Content
External Memory	0x0000 0000	0x00FF FFFF	SDRAM bank 0 (SDRAM) See "SDRAM Interface" on page 1-8.
	0x2000 0000	0x2009 FFFF	ASYNC memory bank 0 (flash memory) See "Flash Memory" on page 1-9.
	All other locations		Not used
Internal Memory	0xF000 0000	0xF003 FFFF	L2 SRAM 256 KB
	0xFF80 0000	0xFF80 3FFF	Data bank A 16 KB
	0xFF90 0000	0xFF90 3FFF	Data bank B 16 KB
	0xFFA0 0000	0xFFA0 3FFF	Instruction SRAM 16 KB
	0xFFB0 0000	0xFFB0 0FFF	Scratch pad SRAM 4 KB
	0xFFC0 0000	0xFFDF FFFF	System MMRs 2 MB
	0xFFE0 0000	0xFFFF FFFF	Core MMRs 2 MB
	All other locations		Reserved

SDRAM Interface

In order to use the 4M x 32 bits (16 MB) of SDRAM memory, the three SDRAM control registers must be initialized. Table 1-2 shows the standard configuration for these registers when using the EZ-KIT Lite in the default configuration. These numbers were derived using the M48LC4M16ATG-75 with a system clock frequency of 120 MHz.

If you are in an EZ-Kit Lite or emulator session, the SDRAM registers are set to the values in Table 1-2 automatically when a reset operation is performed. Clearing the **Use XML reset values** check box on the **Target Options** dialog box, which is accessible through the **Settings** pull-down menu, disables this feature. For more information see the online Help.

Table 1-2. SDRAM Default Settings

Register	Value	Function
EBIU_SDRRC	0x0000074A	RDIV = 1866 clock cycles
EBIU_SDBCTL	0x00000001	Bank 0 enabled Bank 0 size = 16 MB Bank 0 column address width = 8 bits
EBIU_SDGCTL	0x0091998F	32-bit data path External buffering timing disabled t_{WR} = 2 SCLK cycles t_{RCD} = 3 SCLK cycles t_{RP} = 3 SCLK cycles t_{RAS} = 6 SCLK cycles pre-fetch disabled CAS latency = 3 SCLK cycles SCLK1 disabled

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

Flash Memory

The DSM2150 Flash/PLD chip provides a total of 272K x 16 bits of external flash memory, arranged into two independent flash arrays (boot and main). The chip also has a series of configuration registers to control IO and PLD. The chip is initially configured with the memory sectors mapped to the processor, as shown in Figure 1-2.

Use PSDsoft Express™ to modify the default settings of the flash memory. The DSM project must be modified and the flash memory must be reprogrammed using FlashLINK. The default project files can be found in …\Blackfin\EZ-KITs\ADSP-BF535\PSDConfigFiles. Analog Devices does not provide any support for setting up the DSM2150 with PSDsoft Express or programming it using FlashLINK. E-mail STMicroelectronics at apps.psd@st.com for technical assistance.

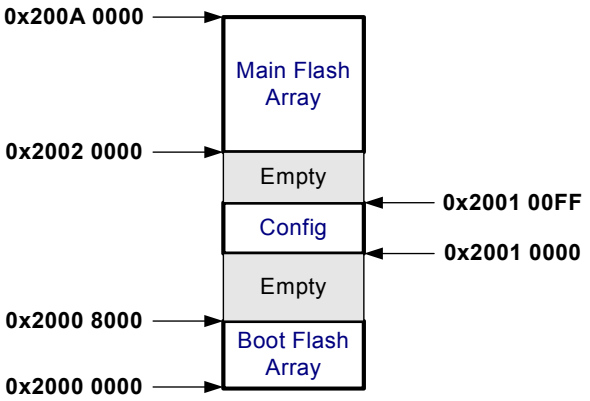


Figure 1-2. Flash Memory Map

To program the flash memory with your boot code, first create a loader file from your processor code. Set up the loader in VisualDSP++ depending on how you plan to boot the flash memory. The two possibilities are to boot the processor in 16-bit external execution mode or in 8-bit boot mode. See "Boot Mode Select Switch (SW1)" on page 2-7 for the boot mode settings.

Next, the loader file must be programmed into the flash memory. This can be done through the processor using the VisualDSP++ Flash Programmer utility (see "Flash Programmer Utility" on page 1-13) or by using the FlashLink programmer.

The DSM2150 can be re-programmed using the FlashLINK JTAG programming cable available from STMicroelectronics (`www.st.com/psd`) for approximately $59. FlashLINK plugs into any PC parallel port. The software development tool, PSDsoft Express, is required to modify the DSM2150 configuration and to operate the FlashLINK cable. PSDsoft Express can be downloaded at no charge from at `www.st.com/psd`.

Programmable Flag Pins

The ADSP-BF535 processor has 16 asynchronous programmable flag (PF) IO pins. During reset, PF9-0 function as inputs to the internal PLL of the processor. They are not valid until 120 us after reset. Table 1-3 describes how the PFs can be used after reset.

Table 1-3. Programmable Flag Pin Summary

Flag	Connects To	Description
PF0	LED4	PF3-0 connect to the LEDs. These can be used to light an LED when a routine completes.
PF1	LED1	
PF2	LED2	
PF3	LED3	
PF4	SW4	PF7-4 connect to the push buttons on the EZ-KIT Lite board and are for user input. Your routine can monitor and execute specific code when a push button is pressed.
PF5	SW5	
PF6	SW6	
PF7	SW7	
PF8		Not used
PF9		Not used
PF10		Not used
PF11		Not used
PF12	PMGMT0	These are used to change the internal voltage of the processor. Refer to "Power Management" on page 1-12 for more information.
PF13	PMGMT1	
PF14	PMGMT2	
PF15	U7.11	Connects to the reset signal of the AD1885 codec (U7). This signal must be output as a high (1) to enable the AD1885 codec.

After a processor reset, all of the PF pins are initialized as inputs. The direction of the PF is configured by the FIO_DIR memory mapped register (MMR). The PFs are set high (1) using the FIO_FLAG_S and cleared (0) using the FIO_FLAG_C MMRs. For more information on configuring the PF pins, see the *ADSP-BF535 Processor Hardware Reference Manual*.

All of the PFs can are brought out to the expansion connector P2. The location of the PF nets can be found in "ADSP-BF535 EZ-KIT Lite Schematic" on page B-1.

Power Management

The PF14-12 pins allow you to program the core voltage of the processor. The default core voltage is 1.5V. Table 1-4 shows the voltage values and corresponding states of the PF14-12 pins.

Table 1-4. Power Settings

PF14 Pin	PF13 Pin	PF12 Pin	VDD_INT Pin
0	0	0	0.9V
0	0	1	1.0V
0	1	0	1.1V
0	1	1	1.2V
1	0	0	1.3V
1	0	1	1.4V
1[1]	**1**	**0**	**1.5V**
1	1	1	1.6V

1 Default settings

When lowering the core voltage of the processor, the frequency of the processor must also be taken into consideration. As you lower the core voltage, the frequency at which the core is running must be decreased.

Example Programs

Example programs are provided with the ADSP-BF535 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 the …\Blackfin\Examples\ADSP-BF535 EZ-KIT Lite subdirectory of the VisualDSP++ installation directory. Please refer to the readme file provided with each example for more information.

Flash Programmer Utility

The ADSP-BF535 EZ-KIT Lite evaluation system includes a Flash Programmer utility. The utility allows you to program the flash memory on the EZ-KIT Lite. The Flash Programmer is installed with VisualDSP++. Once the utility is installed, it is accessible from the **Tools** pull-down menu.

For more information on the Flash Programmer utility, refer to online Help.

Background Telemetry Channel

The ADSP-BF535 USB debug agent supports the background telemetry channel (BTC), which facilitates data exchange between VisualDSP++ and the processor without interrupting processor execution.

The BTC allows the user to view a variable as it is updated or changed, all while the processor continues to execute. For increased performance of the BTC, including faster reading and writing, please check out our latest line of processor emulators at http://www.analog.com/processors/resources/crosscore/emulators/index.html.

For more information about the background telemetry channel, see the *VisualDSP++ User's Guide* or online Help.

2 ADSP-BF535 EZ-KIT LITE HARDWARE REFERENCE

This chapter describes the hardware design of the ADSP-BF535 EZ-KIT Lite board. The following topics are covered.

- "System Architecture" on page 2-2
  Describes the configuration of the ADSP-BF535 (formerly ADSP-21535) processor and explains how the board components interface with the processor.
- "Jumper and Switch Settings" on page 2-5
  Shows the location and describes the function of the configuration jumpers and switches.
- "LEDs and Push Buttons" on page 2-9
  Shows the location and describes the function of the LEDs and push buttons.
- "Connectors" on page 2-12
  Shows the location and gives the part number for all of the connectors on the board. Also, the manufacturer and part number information is given for the mating parts.
- "Specifications" on page 2-15
  Gives the requirements for powering the board.

System Architecture

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

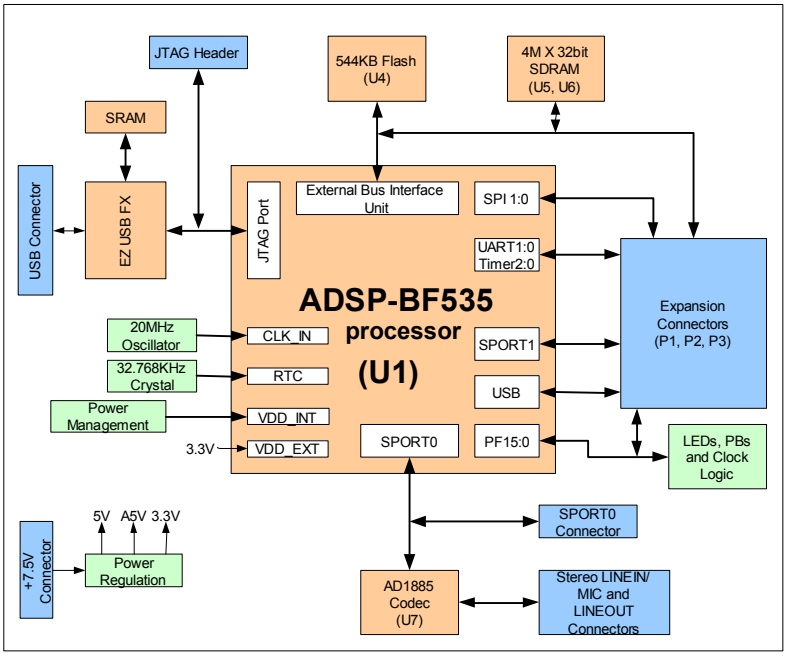


Figure 2-1. System Architecture

This EZ-KIT Lite has been designed to demonstrate the capabilities of the ADSP-BF535 Blackfin processor. The processor has a default core voltage of 1.5V. Refer to "Power Management" on page 1-12 for more information about changing the core voltage without halting the processor. The voltage of the processor's peripheral interface is 3.3V.

A 20 MHz oscillator supplies the input clock to the processor. The speed at which the core and peripherals operate is determined by the configuration of the multiplier select switch (`SW2`) at reset (see "Processor PLL Setup

Switch (SW2)" on page 2-7). By default, the processor core runs at 300 MHz, and the peripheral interface runs at 120 MHz. A 32.768 kHz crystal supplies the real-time clock (RTC) inputs of the processor.

The EZ-KIT Lite board can be configured to boot in all possible ADSP-BF535 boot modes. For information about configuring the boot mode, see "Boot Mode Select Switch (SW1)" on page 2-7.

External Bus Interface

The external bus interface unit (EBIU) connects to 4M x 32 bits of SDRAM (16 MB). The SDRAM memory connects to the synchronous memory select 0 (~SMS0) pin. Refer to "SDRAM Interface" on page 1-8 for information about configuring the SDRAM.

The EBIU also connects to 272K x 16 bits of flash memory. The flash memory connects to the asynchronous memory select (~AMS0) pin. The processor can use this memory for both booting and storing information during normal operation. Refer to "Flash Memory" on page 1-9 for information about using the flash memory.

All of the address, data, and control signals are available externally via the extender connectors (P1-3). The pinout of these connectors can be found in "ADSP-BF535 EZ-KIT Lite Schematic" on page B-1.

SPORT0 Audio Interface

SPORT0 connects to the AD1885 SoundMAX codec (U7). Two 3.5 mm stereo jacks (P5 and P6) allow audio to be input and output. You can supply an audio input to the codec microphone input channel (MIC1) or to the stereo input channel (LINE_IN). The JP1 settings determine the codec channel driven by the input jack (P5). See "Audio Input Select Jumper (JP1)" on page 2-5.

SPORT0 is routed also to an off-board connector (P9). When using the off-board connector, the codec must be held in reset not to drive any of the SPORT0 signals. The codec can be held in reset by driving PF15 low or by setting JP2 as described in "Audio Codec Disable Jumper (JP2)" on page 2-6). PF15 must be pulled high (1) for the codec to function.

TCLK0 and RCLK0 pins are shorted together using R114 and R118.

Expansion Interface

The expansion interface consists of the footprints for three connectors. Table 2-1 lists the interfaces each connector provides. For the exact pinout of the connectors, refer to "ADSP-BF535 EZ-KIT Lite Schematic" on page B-1. Analog Devices does not populate the expansion connectors or provide any additional support for the interface. The mechanical locations of the expansion connectors can be found in "Mechanical Dimensions" on page 2-17.

Table 2-1. Expansion Connector Interfaces

Connector	Interfaces
P1	5V, GND, address, data
P2	3.3V, GND, EBUI control signals, PF15-0, SPI1-0, SPORT1, UART1-0, TMR2-0, NMI
P3	1.5V, GND, reset, USB, CLKOUT, SLEEP

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

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

JTAG Emulation Port

The JTAG emulation port allows an emulator to access the processor's internal and external memories through a 6-pin interface. The JTAG emulation port of the processor also connects to the USB debugging interface. (Note that this is not the processor's USB interface.) When an emulator connects to the board at P8, the USB debugging interface is disabled. See "JTAG (P8)" on page 2-14 for more information.

To learn more about available emulators, contact Analog Devices (see "Product Information").

Jumper and Switch Settings

This section describes the function of the board's jumpers and switches. Figure 2-2 on page 2-6 shows the location of the jumpers and switches.

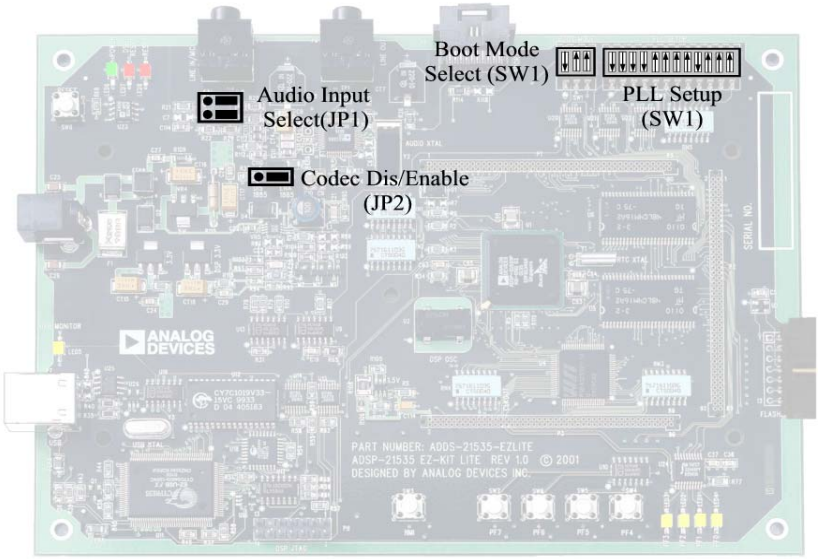
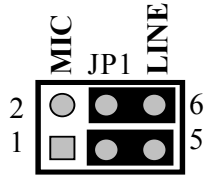
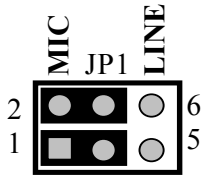


Figure 2-2. Jumper Locations

Audio Input Select Jumper (JP1)

The audio input jack (P5) can connect to the MIC1 and LINE_IN input channels of the AD1885 codec (U7). When the JP1 jumpers connect pins 1 and 3 and pins 2 and 4, P5 connects to the mono MIC1 codec channel. When the jumpers connect pins 3 and 5 and pins 4 and 6, P5 connects to the stereo LINE_IN codec channel. These jumper settings are illustrated in Figure 2-2 on page 2-6. The words MIC and LINE_IN are on the board as a reference.

Table 2-2. Audio Input Jumper Settings (JP1)

Stereo LINE_IN (Default)	Mono MIC1
	

Audio Codec Disable Jumper (JP2)

Placing a jumper between pins 1 and 2 of JP2 holds the AD1885 codec in reset, preventing it from driving signals to the serial port. When a jumper is between pins 2 and 3 of JP2, the AD1885 codec is held in reset until PF15 is set to an output and is asserted. These positions are labeled on the board as DIS and ENA 1885.

Boot Mode Select Switch (SW1)

The boot mode select switch (SW1) determines how the processor boots. Table 2-3 shows the switch settings.

SPI ROM is not available on the EZ-KIT Lite.

Table 2-3. Boot Mode Select Switch

BMODE0 Pin 1	BMODE1 Pin 2	BMODE2 Pin 3	Description
On	On	On	Execute from 16 bit external memory (no-boot)
Off[1]	**On**	**On**	**Boot from 8-bit EPROM**
On	Off	On	Boot from SPI0 ROM (8-bit addresses)
Off	Off	On	Boot from SPI0 ROM (16-bit addresses)
–	–	Off	All others reserved

1 Default settings

Processor PLL Setup Switch (SW2)

The phase lock loop (PLL) of the processor multiplies the 20 MHz input clock by a multiplication factor to set the core clock speed of the processor. Internal to the processor programmable flag pins `PF9-0` are multiplexed with the PLL setup signals `SSEL1-0`, `DF`, and `MSEL6-0`.

During reset, the function of the `PF9-0` pins is to setup the PLL. At this time, the signals are attached to the `SW2` switch to determine the core and external clock speeds of the processor. The `SW2` switch drives the processor pins during reset and, for approximately 120 ms, after reset. Once this time has elapsed, the PFs no longer connect to `SW2` but connect to the general-purpose IO (LEDs, push buttons) on the board. This is done with an external 2-to-1 multiplexer to add flexibility to the EZ-KIT Lite.

The following table shows each switch position and corresponding processor pin.

Table 2-4. PLL Setup Switch (SW2) Functions

Processor Pin	Switch Position	Processor Pin	Switch Position
MSEL0	1	MSEL6	7
MSEL1	2	DF	8
MSEL2	3	SSEL0	9
MSEL3	4	SSEL1	10
MSEL4	5	None	11
MSEL5	6	Bypass	12

Figure 2-3 shows the default setting of the SW2 switch. The setting produces a 300 MHz core clock speed and a 120 MHz peripheral interface speed. For more information about setting up the multiplication factors, refer to "Managing DSP Clocks" section of the *ADSP-BF535 Processor Hardware Reference*.

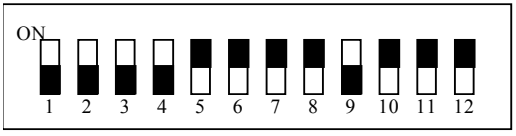


Figure 2-3. Default PLL Setup Switch Setting (SW2)

A switch setting of ON supplies a logic low (0) on the corresponding processor pin.

LEDs and Push Buttons

This section describes the functionality of the LEDs and push buttons. Figure 2-4 shows the locations of the LEDs and push buttons.

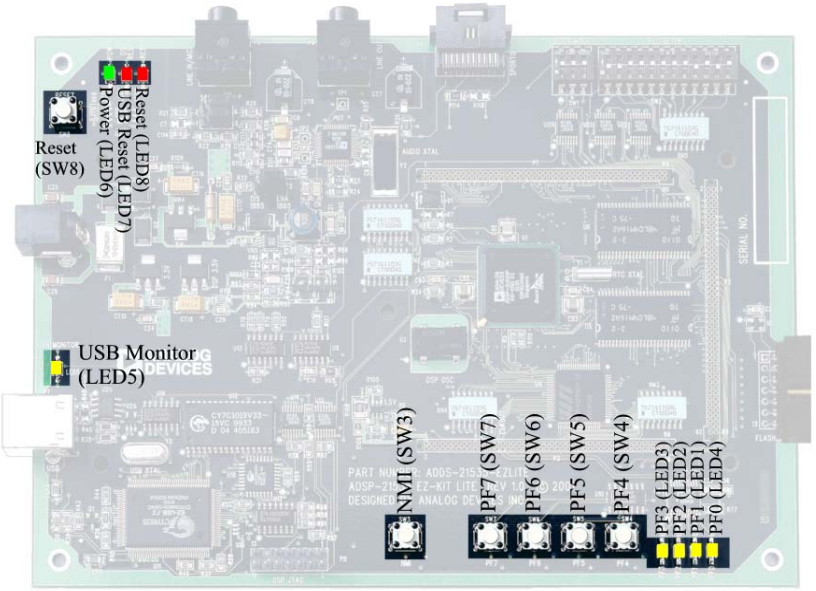


Figure 2-4. LED and Push Button Locations

Programmable Flag LEDs (LED1–4)

Four LEDs connect to four programmable flag (PF) pins, `PF3-0`, of the processor. These LEDs are active high and are lit by an output of `1` from the processor. Refer to "Programmable Flag Pins" on page 1-11 for information about PF programming.

Table 2-5. Programmable Flag LEDs

LED Reference Designator	Processor Programmable Flag Pin
LED4	PF0
LED1	PF1
LED2	PF2
LED3	PF3

USB Monitor LED (LED5)

The USB monitor LED (LED5) indicates that USB communication has been initialized successfully, and you can connect to the processor using a VisualDSP++ EZ-KIT Lite session. This takes approximately 15 seconds. If the LED does not light, try cycling power on the board and/or reinstalling the USB driver (see the *VisualDSP++ Installation Quick Reference Card*).

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

Power LED (LED6)

When LED6 is lit (green), it indicates that power is being supplied to the board properly.

Reset LEDs (LED7 and LED8)

When LED8 is lit, it indicates that master reset of all the major ICs is active. When LED7 is lit, the USB interface chip (U11) is being reset. The USB chips reset only on power-up, or if USB communication has not been initialized.

Non-Maskable Interrupt Push Button (SW3)

The SW3 button connects to the non-maskable interrupt (NMI) pin of the processor. When pressed, the processor vectors to the NMI vector.

Programmable Flag Push Buttons (SW4–7)

Four push buttons are provided for general-purpose user input. SW4-7 connect to the processor's programmable flag pins PF7-4. The push buttons are active high and, when pressed, send a high (1) to the processor. Refer to "Programmable Flag Pins" on page 1-11 for information about PF programming. Table 2-6 lists each push button and corresponding programmable flag pin.

Table 2-6. Programmable Flag Switches

Push Button Reference Designator	Processor Programmable Flag Pin
SW4	PF4
SW5	PF5
SW6	PF6
SW7	PF7

Reset Push Button (SW8)

The RESET push button resets all of the ICs on the board. This reset does not affect the USB interface chip (U11) unless communication has not been initialized with a PC. After USB communication has been initialized, the only way to reset the USB is by powering down the board.

Connectors

This section describes the connector functionality and provides information about mating connectors. The connector locations are shown in Figure 2-5.

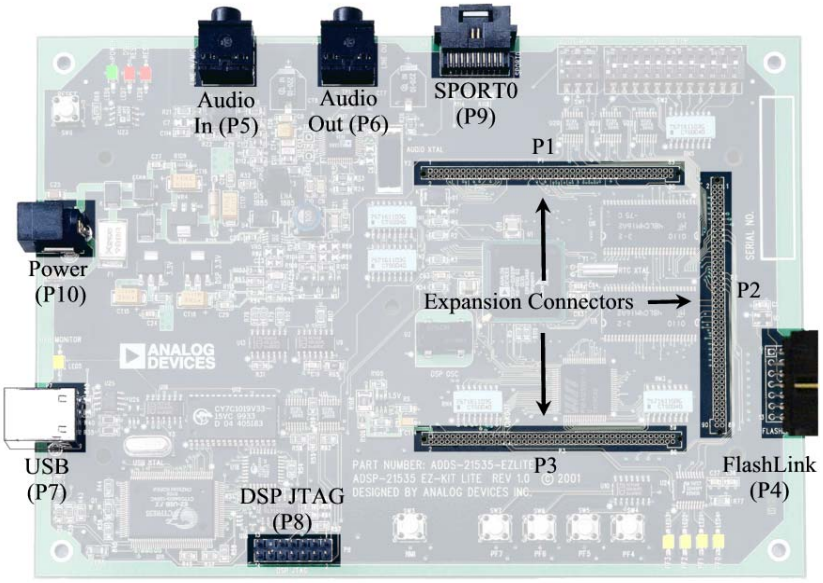


Figure 2-5. Connector Locations

Expansion Interface (P1–3)

Three board-to-board connector footprints provide signals for most peripheral interfaces of the processor. Analog Devices does not populate the expansion connectors and does not provide any additional support for the interface. For more information, see “Expansion Interface” on page 2-4. Contact Samtec for the connector availability and pricing.

Part Description	Manufacturer	Part Number
90-position 0.05” spacing (P1, P2, P3)	SAMTEC	SFM-145-01-S-D
Mating Connectors		
90-position 0.05” spacing (through hole)	SAMTEC	TFM-145-x1 series
90-position 0.05” spacing (surface mount)	SAMTEC	TFM-145-x2 series
90-position 0.05” spacing (low cost)	SAMTEC	TFC-145 series

FlashLINK (P4)

The FlashLINK connector allows you to configure and program the STMicroelectronics DSM2150 flash/PLD chip. See “Flash Memory” on page 1-9 for more information.

Part Description	Manufacturer	Part Number
Right-angle 7X2 shrouded 0.1” spacing	TYCO	2-767004-2
Mating Assembly		
FlashLINK JTAG programmer	ST MICRO	L-101B

Audio (P5 and P6)

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

Part Description	Manufacturer	Part Number
3.5 mm stereo jack (P5, P6)	SHOGYO	SJ-0359AM-5
Mating Cable		
3.5 mm stereo plug to 3.5 mm stereo cable	RADIO SHACK	42-2387A

USB (P7)

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

Part Description	Manufacturer	Part Number
Type B USB receptacle (P7)	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

JTAG (P8)

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

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

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

SPORT0 (P9)

SPORT0 connects to a 20-pin connector. The pinout of the connector can be found in "ADSP-BF535 EZ-KIT Lite Schematic" on page B-1. Contact AMP for the connector availability and pricing.

Part Description	Manufacturer	Part Number
20-position AMPMODU system 50 receptacle (P9)	AMP	104069-1
Mating Connector		
20-position AMPMODU ribbon cable connector	AMP	111196-4

Power Connector (P10)

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

Part Description	Manufacturer	Part Number
2.5 mm power jack (P10)	SWITCHCRAFT	RAPC712
	DIGI-KEY	SC1152-ND

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

Specifications

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

Power Supply

The power connector supplies DC power to the EZ-KIT Lite board. Table 2-7 shows the connector pinout.

Table 2-7. Power Connectors

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

Board Current Measurements

The ADSP-BF535 EZ-KIT Lite board provides eight zero-ohm resistors that can be removed to measure current draw. Table 2-8 lists and describes each resistor and the voltage plane on the board.

Table 2-8. Current Resistor Measurements

Resistor	Voltage Plane	Description
R2	VDD_RTC	Processor real-time clock supply
R3	VDD_EXT	Processor external interface supply

Table 2-8. Current Resistor Measurements (Cont'd)

Resistor	Voltage Plane	Description
R6	VDD_INT	Processor internal interface supply
R7	VDD_PCIEXT	Processor PCI interface supply
R8	VDD_PLL	Processor phase lock loop supply
R110	5V	5V supply
R111	3V	3V supply to all non processor-related components
R113	3V_DSP	3V to processor-related components

Mechanical Dimensions

Figure 2-6 shows the location of the mounting holes and PIN1 of each expansion connector.

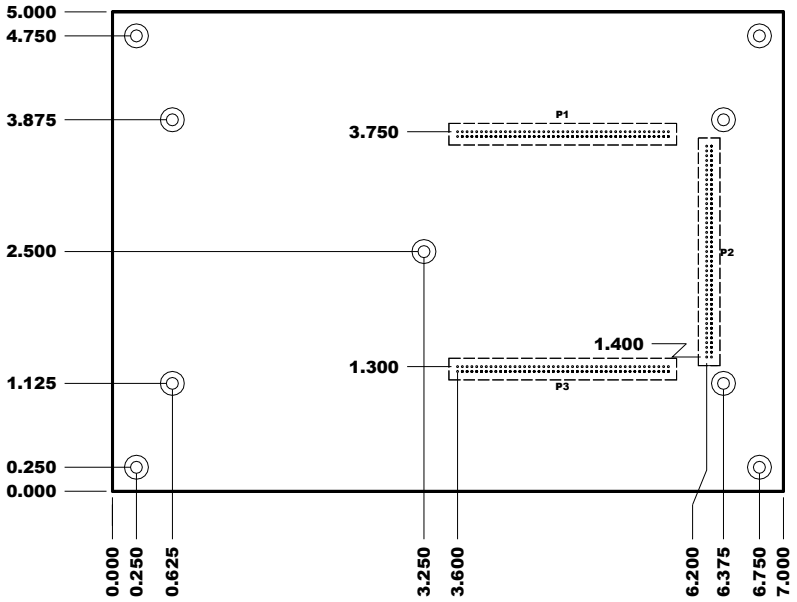


Figure 2-6. Mechanical Drawing

A ADSP-BF535 EZ-KIT LITE BILL OF MATERIALS

The bill of materials corresponds to "ADSP-BF535 EZ-KIT Lite Schematic" on page B-1. Please check the latest schematic on the Analog Devices Web site:
http://www.analog.com/Processors/Processors/DevelopmentTools/technicalLibrary/manuals/DevToolsIndex.html#Evaluation%20Kit%20Manuals.

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
2	3	74LVC14A SOIC14 HEX-INVER-SCHMITT -TRIGGER	U9-10, U19	TI	74LVC14AD
3	1	IDT74FCT3244APY SSOP20 3.3V-OCTAL-BUFFER	U24	IDT	IDT74FCT3244APY
4	1	24.576MHZ SMT OSC005 CRYSTAL	Y2	EPSON	MA505 24.576M-C2
5	1	CY7C64603-128 PQFP128 USB-TX/RX MICRO-CONTROLLER	U11	CYPRESS	CY7C64603-128NC
6	1	MMBT4401 SOT-23 NPN TRANSISTOR 200MA	Q1	FAIRCHILD	MMBT4401
7	1	74LVC00AD SOIC14	U13	PHILIPS	74LVC00AD

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
8	1	24LC00-SN SOIC8 128 BIT SERIAL EEPROM	U25	MICROCHIP	24LC00-SN
9	1	ADP3331ART SOT23-6 ADJ 200MA REGULA- TOR	VR3	ANALOG DEVICES	ADP3331ART
10	3	BSS123 SOT23D NMOS FET	M1-3	FAIRCHILD	BSS123
11	1	CY7C1019BV33-15VC SOJ32 128K X 8 SRAM	U12	CYPRESS	CY7C1019BV33- 12VC
12	1	SN74AHC1G02 SOT23-5 SINGLE-2 INPUT-NOR	U16	TI	SN74AHC1G02 DBVR
13	1	SN74LV164A SOIC14 8-BIT-PARAL- LEL-SERIAL	U17	TI	SN74LV164AD
14	1	CY7C4201V-15AC TQFP32 64-BYTE-FIFO	U18	CYPRESS	CY7C4201V-15AC
15	1	12.0MHZ THR OSC006 CRYSTAL	Y3	DIG01	300-6027-ND
16	2	MT48LC4M16 TSOP54 4MX16-SDRAM-133M HZ	U5-6	MICRON	MT48LC4M16A2 TG-75
17	1	32.768kHz TH OSC007 CRYSTAL	Y1	ECPLITEK	EC38T
18	1	SN74AHC1G00 SOT23-5 SINGLE-2- INPUT-NAND	U26	TI	SN74AHC1G00 DBVR
19	1	21535 DSM2150F5V “U4”	U4	ST MICRO	DSM2150F5V

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
20	2	1000pF 50V 5% 1206 CERM	C25-26	AVX	12065A102JAT2A
21	2	0.1uF 50V 10% 1206 CERM	C8-9	PHILIPS	12062R104K9BB2
22	1	ADM708SAR SOIC8 VOLTAGE-SUPERVI-SOR	U23	ANALOG DEVICES	ADM708SAR
23	1	AD1885JST LQFP48 AC97 STEREO CODEC	U7	ANALOG DEVICES	AD1885JST
24	2	ADP3338AKC-33 SOT-223 3.3V-1.0AMP REGULA-TOR	VR1-2	ANALOG DEVICES	ADP3338AKC-3.3
25	1	ADP3339AKC-5 SOT-223 5V-1.5A REGULATOR	VR4	ANALOG DEVICES	ADP3339AKC-5-REEL
26	1	ADP3088 MSOP8 500MA-BUCK-REGU-LATOR	VR5	ANALOG DEVICES	ADP3088ARM-REEL
27	1	ADSP-21535PKB-300 PBGA260 308KBYTES-BLACKFIN	U1	ANALOG DEVICES	ADSP-21535PKB-300
28	5	RUBBER FEET BLACK	MH1-5	MOUSER	517-SJ-5018BK
29	1	PWR 2.5MM_JACK CON005 RA	P10	SWITCH-CRAFT	SC1152-ND12
30	1	USB 4PIN CON009 USB	P7	MILL-MAX	897-30-004-90-000000
31	1	.05 10X2 CON014 RA	P9	AMP	104069-1
32	6	SPST-MOMENTARY SWT013 6MM	SW3-8	PANASONIC	EVQ-PAD04M
33	1	DIP12 SWT014	SW2	DIGI-KEY	CKN3063-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
34	1	DIP3 SWT015	SW1	DIGI-KEY	CKN3055-ND
35	1	IDC 7X2 IDC7X2SRDRA RIGHT ANGLE SHROUDED	P4	MOLEX	70247-1401
36	23	0.00 1/8W 5% 1206	R2-3, R6-12, R21,R63-64, R77, R97, R111-118, R127	YAGEO	0.0ECT-ND
37	2	220uF 10V 20% E ELEC	CT7-8	SPRAGUE	293D227X9010E2T
38	5	AMBER-SMT LED001 GULL-WING	LED1-5	PANASONIC	LN1461C-TR
39	2	22pF 50V 5% 805 CERM	C5-C6	AVX	08055A220JAT
40	79	0.01uF 100V 10% 805 CERM	C19, C30-92, C94, C96-97, C99-109, C116	AVX	08051C103KAT2A
41	1	0.22uF 25V 10% 805 CERM	C114	AVX	08053C224FAT
42	5	0.1uF 50V 10% 805 CERM	C3, C24, C27-29	AVX	08055C104KAT
43	4	10uF 16V 10% C TANT	CT15-18	SPRAGUE	293D106X9025C2T
44	44	10K 100MW 5% 805	R1, R13-19, R31-32, R37, R44-45, R47-54, R57, R59-61, R66, R68, R78-81	AVX	CR21-103J-T
45	44	10K 100MW 5% 805	R83-84, R87-88, R90-93, R105, R120-122, R125	DALE	CRCW0805-103JRT1

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
46	4	33 100MW 5% 805	R4-5, R46, R119	AVX	CR21-330JTR
47	5	4.7K 100MW 5% 805	R55-56, R58, R62, R107	AVX	CR21-4701F-T
48	1	1M 100MW 5% 805	R41	AVX	CR21-1004F-T
49	1	1.5K 100MW 5% 805	R43	AVX	CR21-1501F-T
50	1	22uF 16V 10% D TANT	CT1	DIG01	PCT3226CT-ND
51	3	2.21K 1/8W 1% 1206	R30, R35, R40	AVX	CR32-2211F-T
52	4	10uF 16V 10% B TANT	CT4, CT19-21	AVX	TAJB106K016R
53	1	1A HSM160J DO-214AA SCHOTTKY	D4	MICRO-SEMI	HSM160J
54	5	100 100MW 5% 805	R67, R82, R85-86, R89	AVX	CR21-101J-T
55	1	1000 100MHZ 1.5A FER002 0.06 CHOKE	FER9	MURATA	PLM250S40T1
56	3	2A S2A_RECT DO-214AA SILICON RECTIFIER	D1-3	GENER-ALSEMI	S2A
57	8	600 100MHZ 500MA 1206 0.70 BEAD	FER1-8	DIGIKEY	240-1019-1-ND
58	1	0.047UF 16V 10% 1206	C10	AVX	12065C473JATME
59	2	270PF 50V 10% 805	C11, C13	KEMET	C1206C271J5GA C210
60	6	1UF 16V 10% 805 X7R	C4, C22, C110-113	MURATA	GRM40X7R105 K016AL
61	6	470PF 100V 10% 1206 CERM	C12, C14-16, C20-21	AVX	12061A471JAT2A

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
62	2	30PF 100V 5% 1206	C17-18	AVX	12061A300JAT2A
63	3	10UF 25V +80-20% 1210 Y5V	C93, C95, C98	MURATA	GRM235Y.5V106 Z025
64	1	0.47UF 20V 10% A TANT	CT14	KEMET	T491A474K025AS
65	1	16K 1/8W5% 1206	R65	DALE	CRCW1206-163JRT1
66	1	53.6K 1/10W 1% 805	R95	PHILIPS	9C08052A5362 FKRT/R
67	1	165K 1/10W 1% 805	R102	PHILIPS	9C08052A1653 FKRT/R
68	1	316K 1/10W 1% 805	R103	PHILIPS	9C08052A3163 FKRT/R
69	1	332K 1/10W 1% 805	R101	PHILIPS	9C08052A3323 FKRT/R
70	1	665K 1/10W 1% 805	R100	PHILIPS	9C08052A6653 FKRT/R
71	1	10UH 47+/-20 IND001	L1	TDK	SLF7045T-100M1R1-2
72	1	243.0K 1/10W 1% 805	R106	PHILIPS	9C08052A2433 FKRT/R
73	1	1.00M 1/4W 1% 1210	R108	PANASONIC ECG	ERJ-14NF1004U
74	3	10K 31MW 5% RNET8	RN6-8	CTS	746X101103J
75	2	39PF 50V 5% 805 NPO	C1-C2	PANASONIC	ECJ-2VC1H390J
76	5	10K 100MW 2% RNET16 BUSSED	RN1-5	CTS	767-161-103G
77	1	1K 1/8W 5% 1206	R38	AVX	CR32-102J-T
78	6	10K 1/8W 5% 1206	R23-27, R33	DALE	CRCW1206-1002FRT1

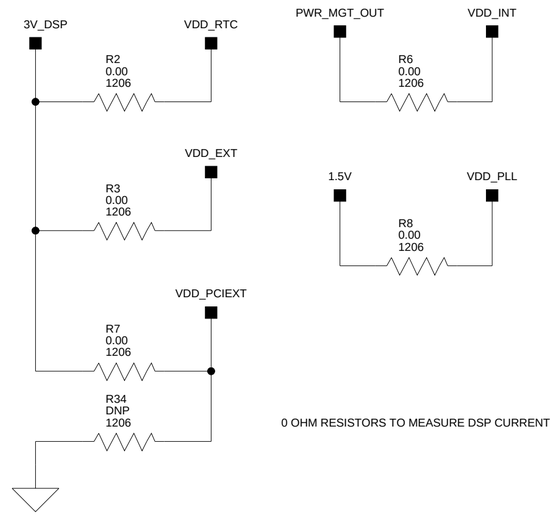
Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
79	1	100K 1/8W 5% 1206	R109	DALE	CR1206-1003FTR1
80	1	20.0K 1/8W 1% 1206	R104	DALE	CRCW1206-2002FRT1
81	3	22 1/8W 5% 1206	R36, R39, R126	DALE	CR1206-22R0JTR
82	7	270 1/8W 5% 1206	R69-73, R75-76	AVX	CR32-271J-T
83	4	4.7K 1/8W 5% 1206	R20, R22, R28-29	AVX	CR32-472J-T
84	1	680 1/8W 5% 1206	R74	AVX	CR32-681J-T
85	1	20MHZ 1/2 OSC001	U2	ECLIPTEK	EC1100HS-20.000MHZ
86	2	RED-SMT LED001 GULL-WING	LED7-8	PANASONIC	LN1261C
87	1	GREEN-SMT LED001 GULL-WING	LED6	PANASONIC	LN1361C
88	5	1uF 25V 20% A TANT -55+125	CT9-13	PANASONIC	ECS-T1EY105R
89	5	QS3257Q QSOP16 QUICKSWITCH-257	U14-15, U20-22	ANALOG DEVICES	ADG774ABRQ
90	1	IDC 3X1 IDC3X1	JP2	BERG	54101-T08-03
91	1	IDC 3X2 IDC3X2	JP1	BERG	54102-T08-03
92	1	IDC 7X2 IDC7X2	P8	BERG	54102-T08-07
93	3	IDC 2PIN_JUMPER 0.1	SJ1-3	MOLEX	15-38-1024
94	1	2.5A RESETABLE FUS001	F1	RAYCHEM CORP.	SMD250-2
95	2	3.5MM STEREO_JACK CON001	P5-6	A/D ELEC-TONICS	ST-323-5

ADSP-BF535 EZ-KIT LITE

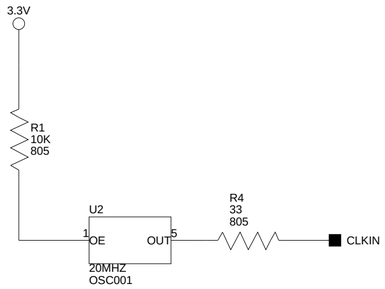
Approvals	Date
Drawn	
Checked	
Engineering	

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

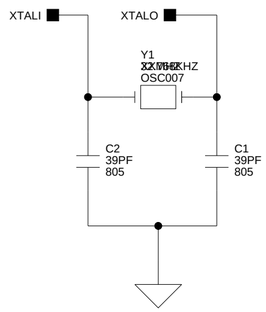
Title	ADSP-BF535 EZ-KIT LITE - TITLE		
Size C	Board No. A0162-2000		Rev 1.6
Date 3-12-2003_15:48		Sheet 1 of 12	

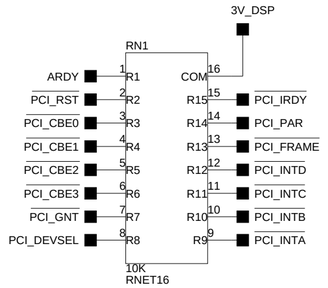


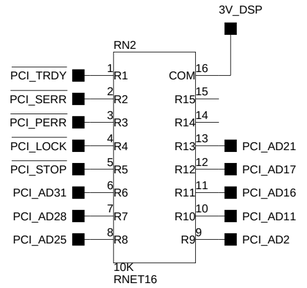
0 OHM RESISTORS TO MEASURE DSP CURRENT

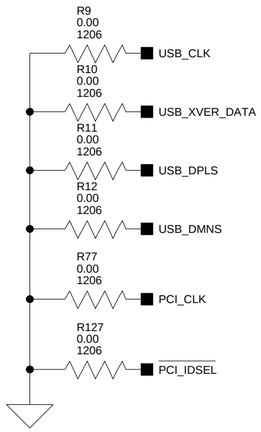


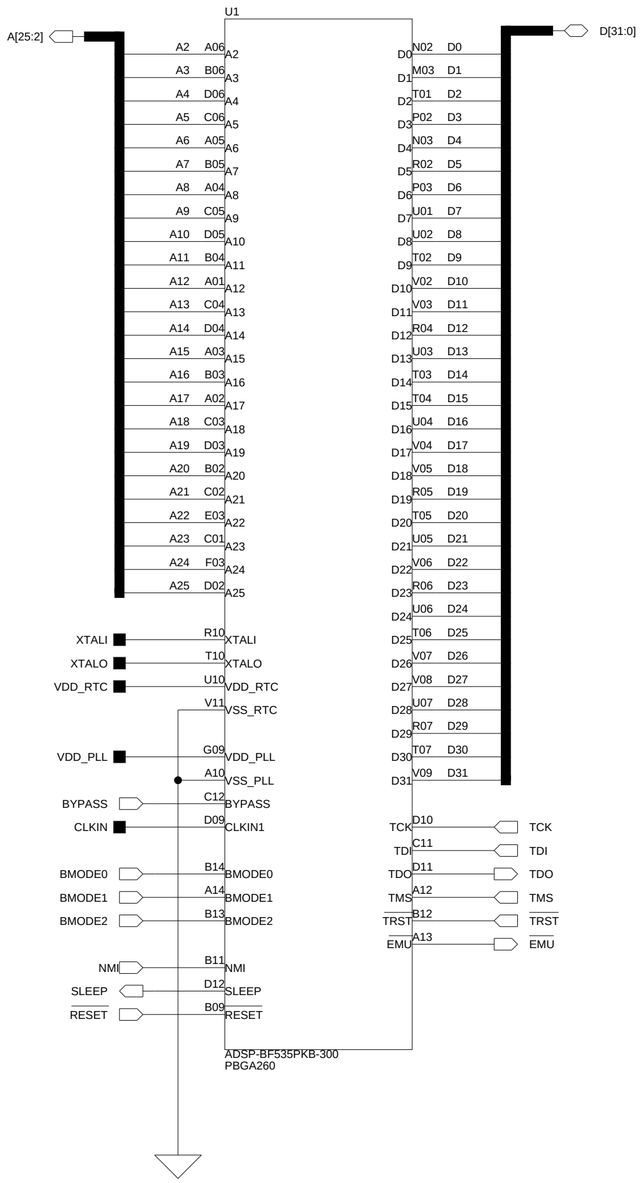
FOR RTC

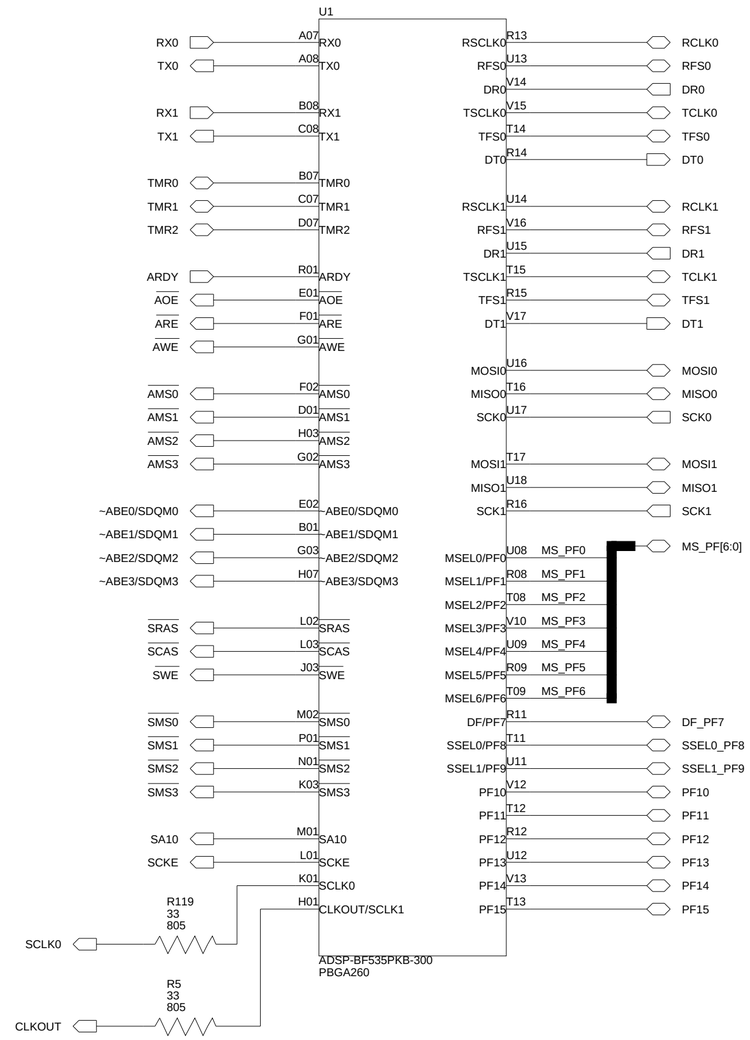


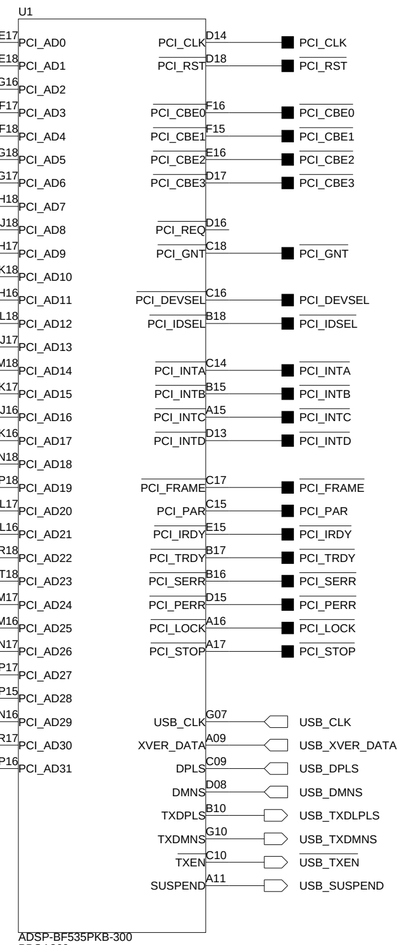


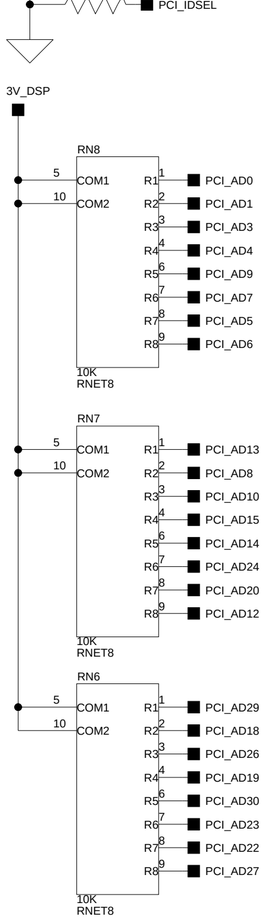












Approvals	Date
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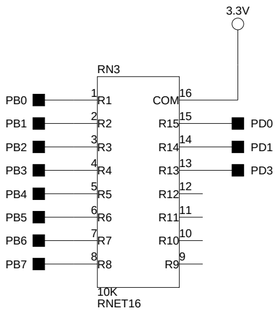
Checked	
Engineering	

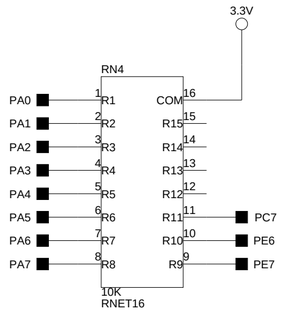
ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

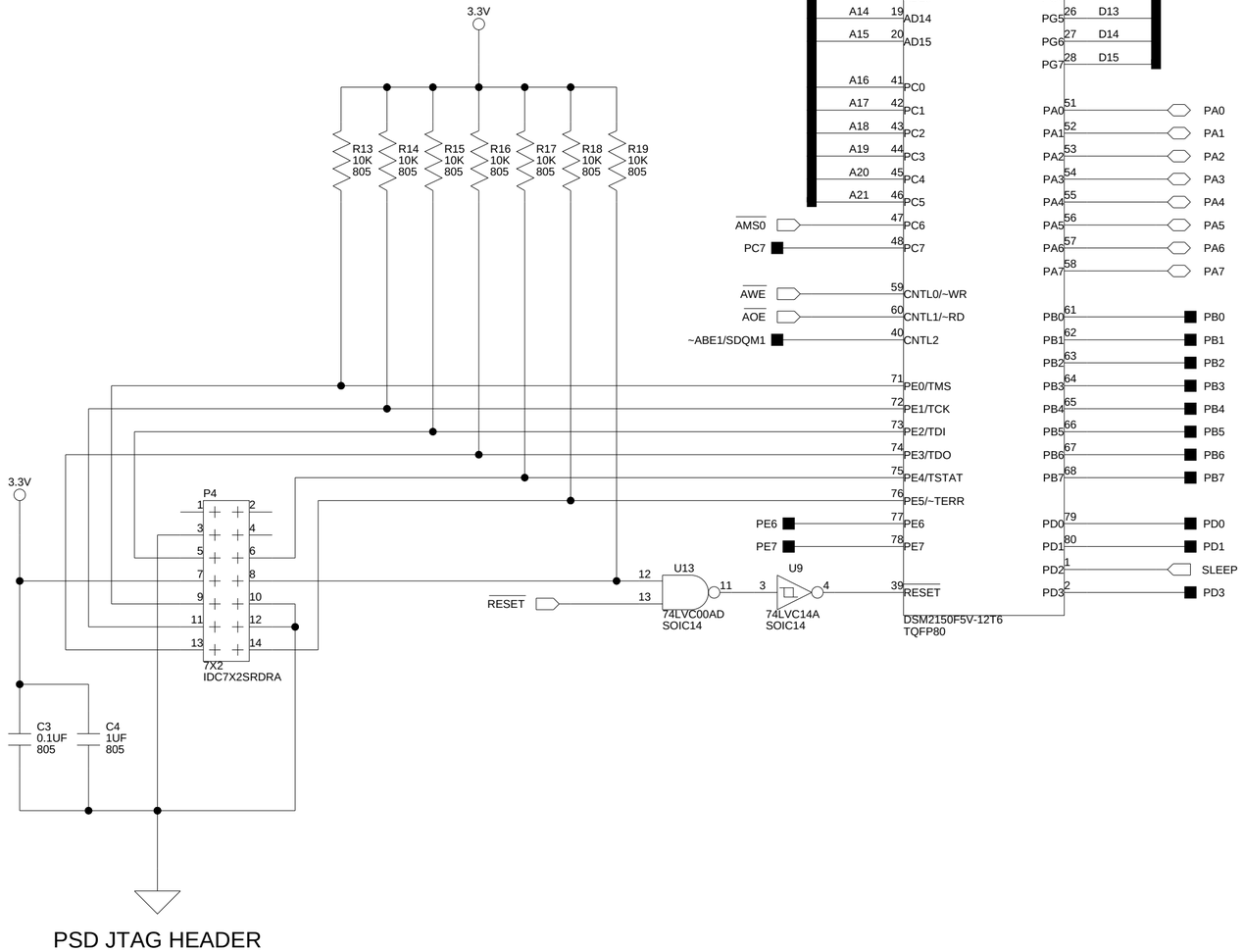
Title: ADSP-BF535 EZ-KIT LITE - DSP

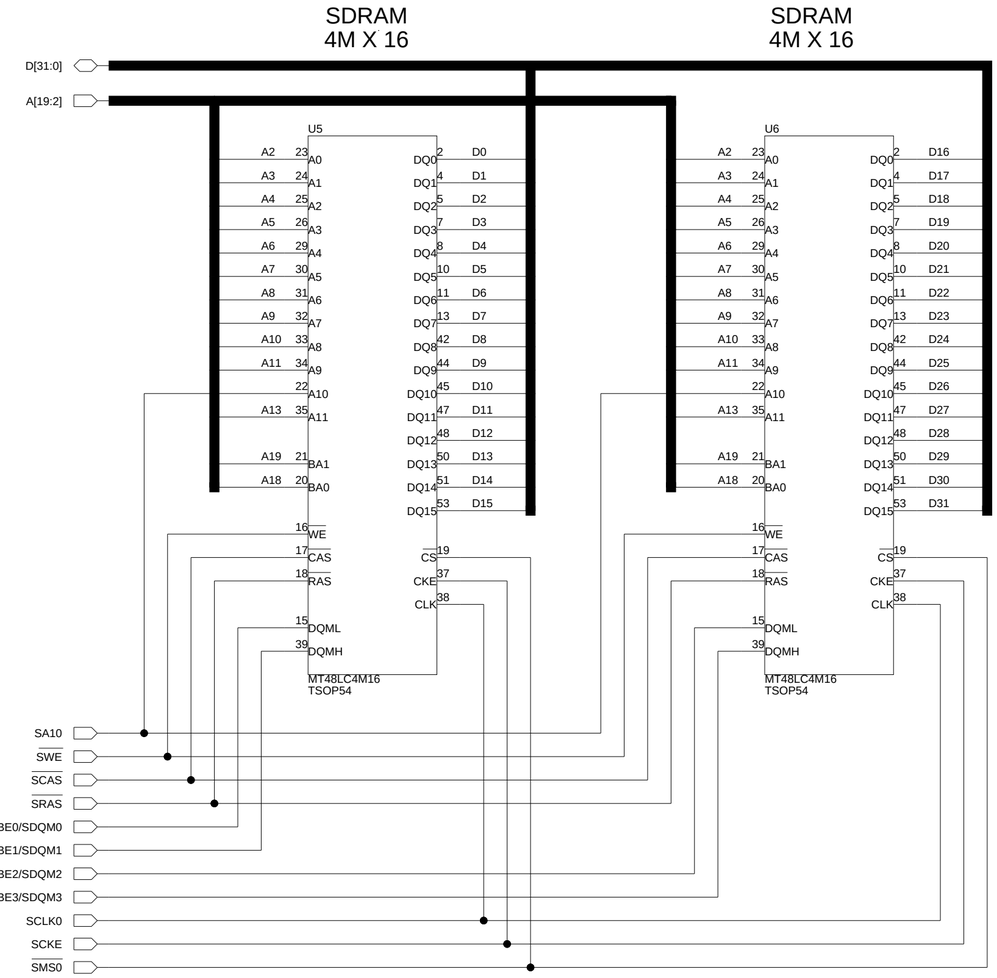
Size	Board No.	Rev
C	A0162-2000	1.6

Date: 3-25-2003_9:50 Sheet 2 of 12









Approvals	Date
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ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
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Title: ADSP-BF535 EZ-KIT LITE - DSP MEMORY

Size	Board No.	Rev
C	A0162-2000	1.6

Date: 3-12-2003_15:48 Sheet 3 of 12

AUDIO CODEC
AD1885

SJ2
SHORTING JUMPER
DEFAULT=4 & 6

SJ1
SHORTING JUMPER
DEFAULT=3 & 5

JP1 SETTINGS

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

* Denotes Default Setting

POPULATE TO COMPLY WITH PC99

R21 0.00 1206 ALT_VAL=1K
C114 0.22UF 805
C7 0.01UF 1206 DNP
AGND

LINE IN/MIC
P5
CON001
AGND
FER2 600 1206
FER3 600 1206
C15 470PF 1206
C14 470PF 1206
JP1
R29 4.7K 1206
R22 4.7K 1206
R28 4.7K 1206
R20 4.7K 1206
C112 1UF 805
C113 1UF 805
D5 VC0805 40A 805
D6 VC0805 40A 805
SHGND
R30 2.21K 1206

HEAD PHONE OUT
P6
CON001
FER1 600 1206
FER4 600 1206
CT7 220UF E
CT8 220UF E
C12 470PF 1206
C16 470PF 1206
R27 10K 1206
R33 10K 1206
D7 VC0805 40A 805
D8 VC0805 40A 805

CT4 10UF B
C8 0.1UF 1206
C11 270PF 805
C13 270PF 805
C110 1UF 805
C111 1UF 805
C10 0.047UF 1206
C9 0.1UF 1206
TP1
TP2
TP3

A5V
3.3V

U7
Analog Signals
Digital Signals

25	AVDD1
38	AVDD2
43	AVDD3
26	AVSS1
40	AVSS2
44	AVSS3
27	VREF
28	VREFOUT
30	AFILT2
29	AFILT1
32	FILT_L
31	FILT_R
33	RX3D
34	CX3D
22	MIC2
21	MIC1
24	LINE_IN_R
23	LINE_IN_L
36	LINE_OUT_R
35	LINE_OUT_L
37	MONO_OUT
41	HP_OUT_R
39	HP_OUT_L

AD1885JST
LQFP48

1	VDD1
9	VDD2
4	VSS1
7	VSS2
2	XTAL_IN
3	XTL_OUT
8	SDATA_IN
5	SDATA_OUT
6	BIT_CLK
10	SYNC
11	RESET
46	ID1
45	ID0
48	JS1
47	JS0
12	PC_BEEP
13	PHONE_IN
14	AUX_L
15	AUX_R
16	VIDEO_L
17	VIDEO_R
18	CD_L
20	CD_R
19	CD_GND_REF

Y2 24.576MHZ OSC005
C6 22PF 805
C5 22PF 805
R114 0.00 1206
R118 0.00 1206
DR0
DT0
TCLK0
RFS0
RCLK0
R26 10K 1206
R25 10K 1206
R23 10K 1206
R24 10K 1206

JP2: 1885 DISABLE

	1 & 2	DISABLE AD1885
*	2 & 3	NORMAL OPERATION

* DENOTES DEFAULT SETTING

JP2
IDC3X1
SJ3
SHORTING JUMPER
DEFAULT=1 & 2
PF15
R32 10K 805
R31 10K 805
W1 COPPER
R112 0.00 1206 DNP

ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
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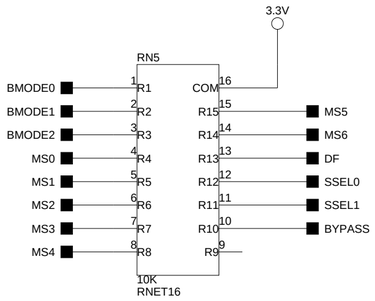
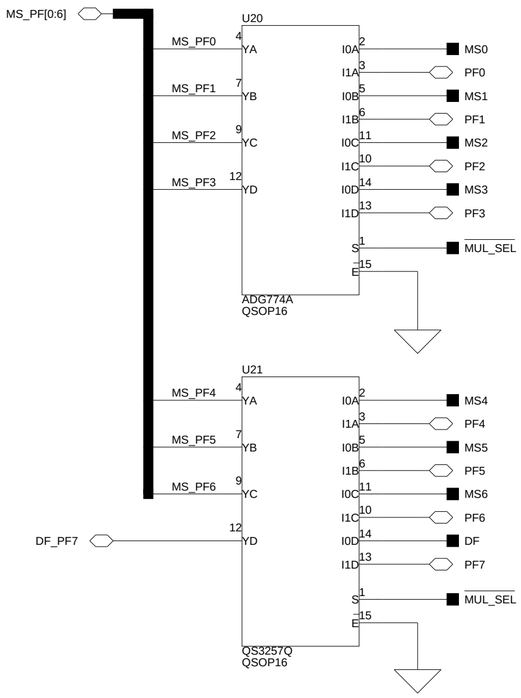
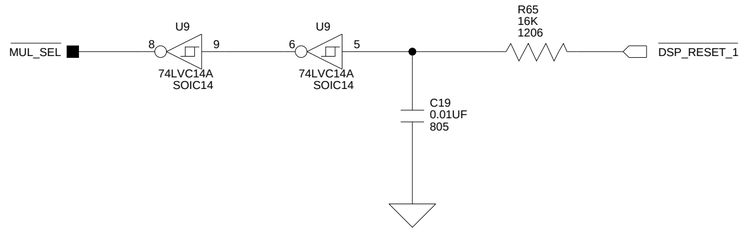
Title: ADSP-BF535 EZ-KIT LITE - AUDIO CODEC

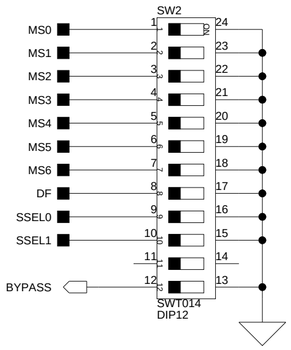
Size	Board No.	Rev
C	A0162-2000	1.6

Date: 3-21-2003_12:05 Sheet 4 of 12







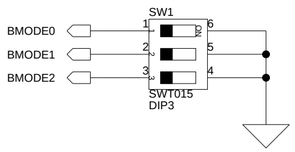


SW2: CLOCK MULTIPLIER SELECT SWITCH

1	2	3	4	5	6	7	8	9	10	11	12
OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	ON

DEFAULT SETTINGS:
Internal Clock - 15:1 - 300MHZ
External Clock - 2.5:1 - 120MHZ

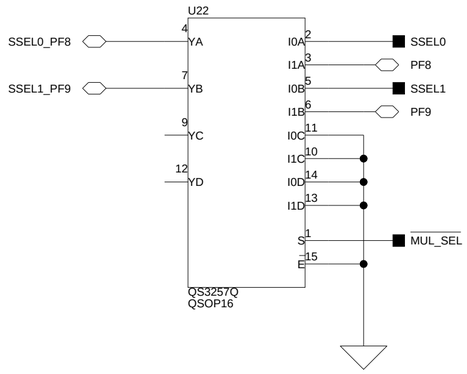
REFER TO DSP HARDWARE REFERENCE FOR DETAILED SETTING INFOMATION

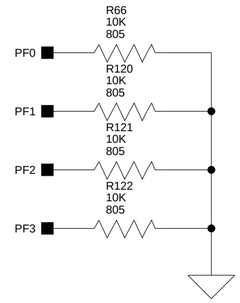


SW1 SETTINGS: BOOT MODE SELECTION

	BMODE2	BMODE1	BMODE0	BOOT MODE
*	ON	ON	ON	EXECUTE 16-BIT EXTERNAL
	ON	ON	OFF	8-BITS ROM
	ON	OFF	ON	SPI0 ROM (8-BIT ADDRESS)
	ON	OFF	OFF	SPI0 ROM (16-BIT ADDRESS)
	OFF	-	-	ALL OTHERS RESERVED

* = DEFAULT





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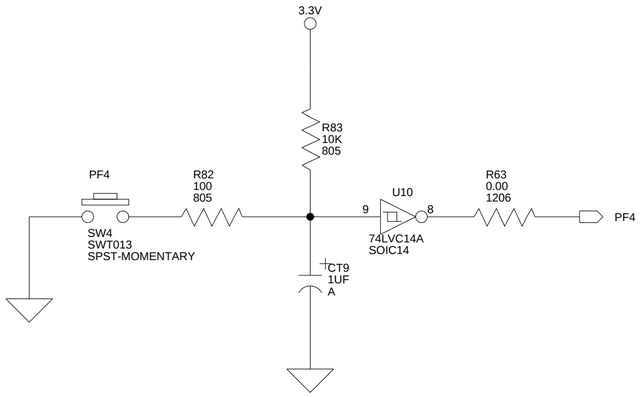
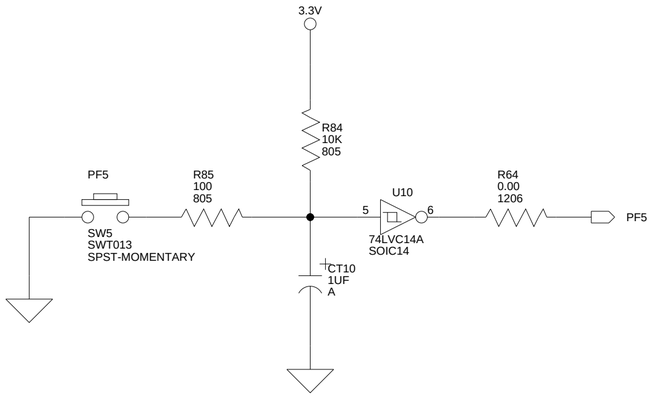
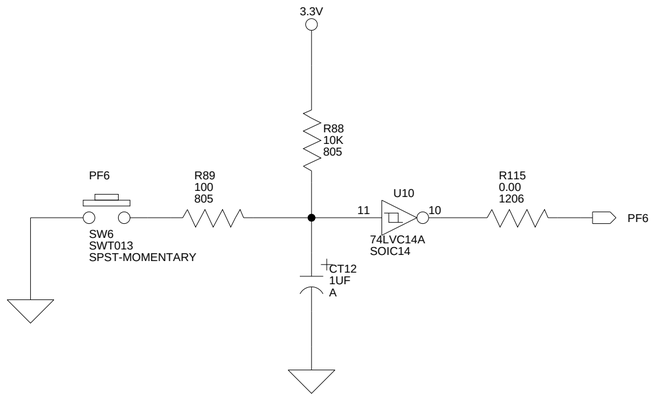
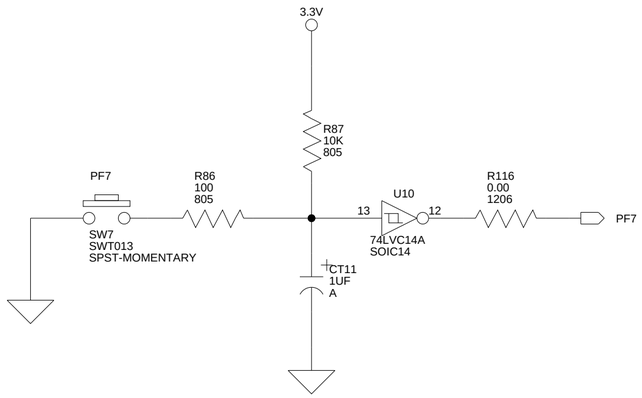
ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

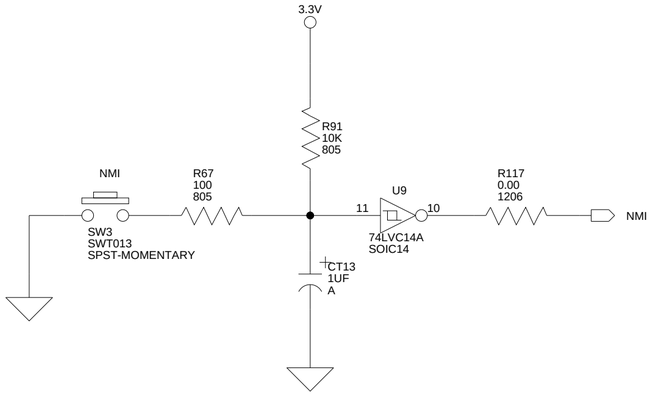
Title	ADSP-BF535 EZ-KIT LITE - CONFIG		
Size C	Board No. A0162-2000		Rev 1.6
Date 3-12-2003_15:48		Sheet 5 of 12	

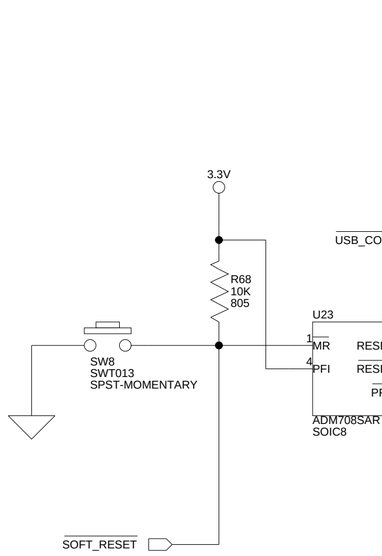


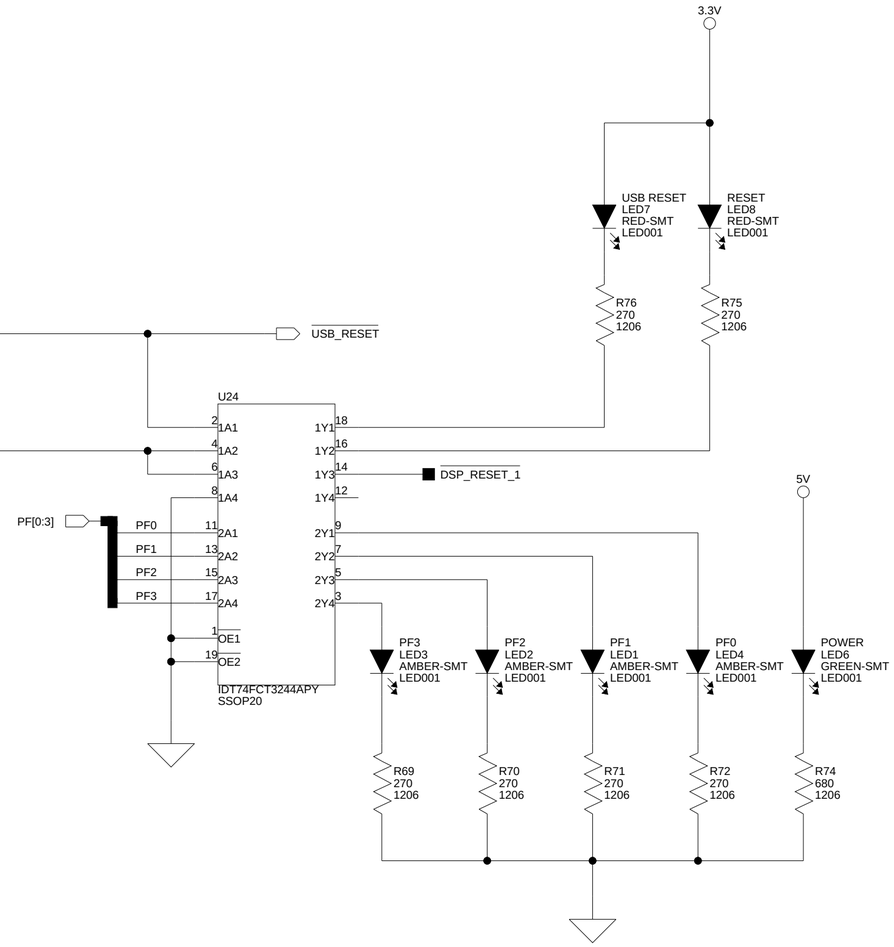


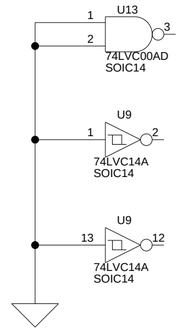


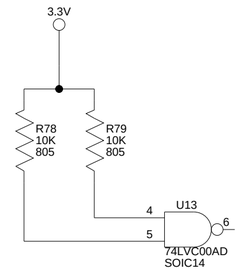


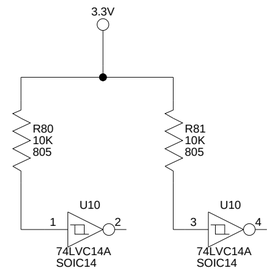












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ANALOG DEVICES
20 Cotton Road
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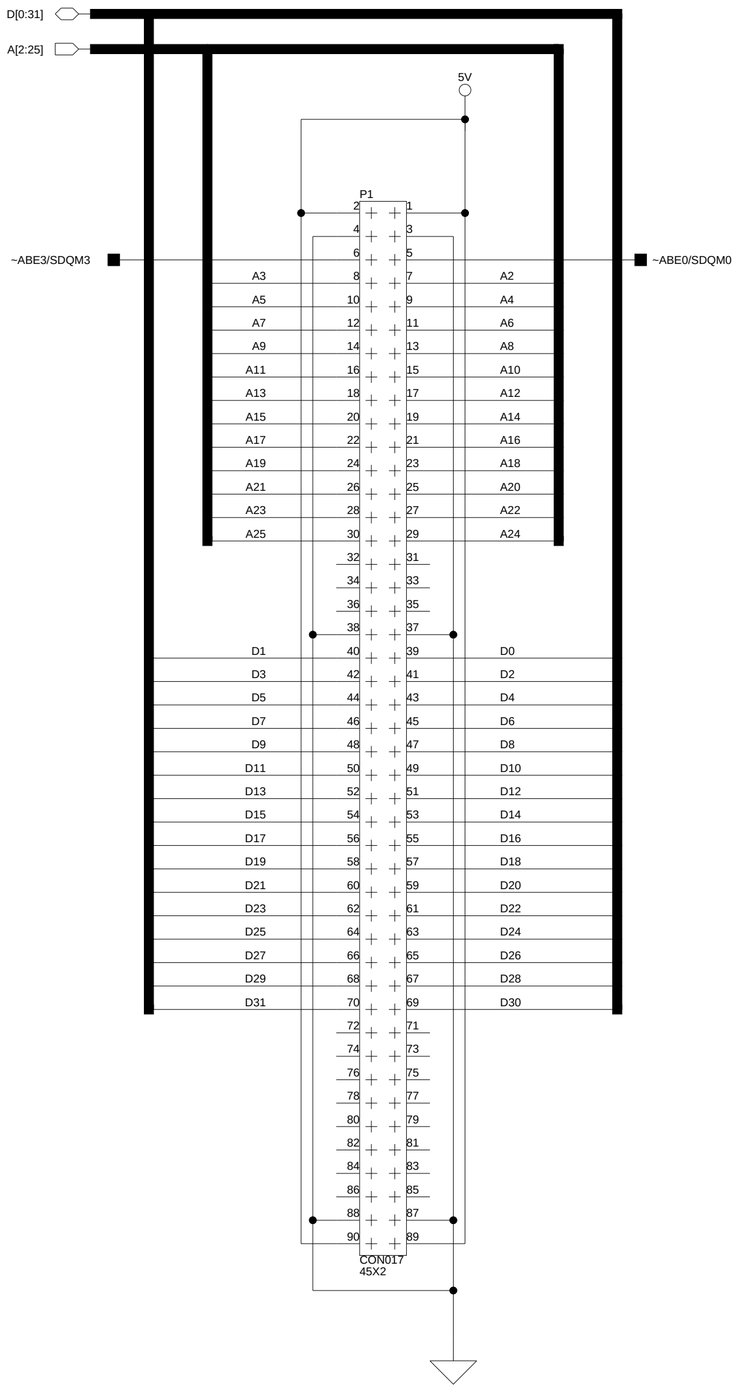
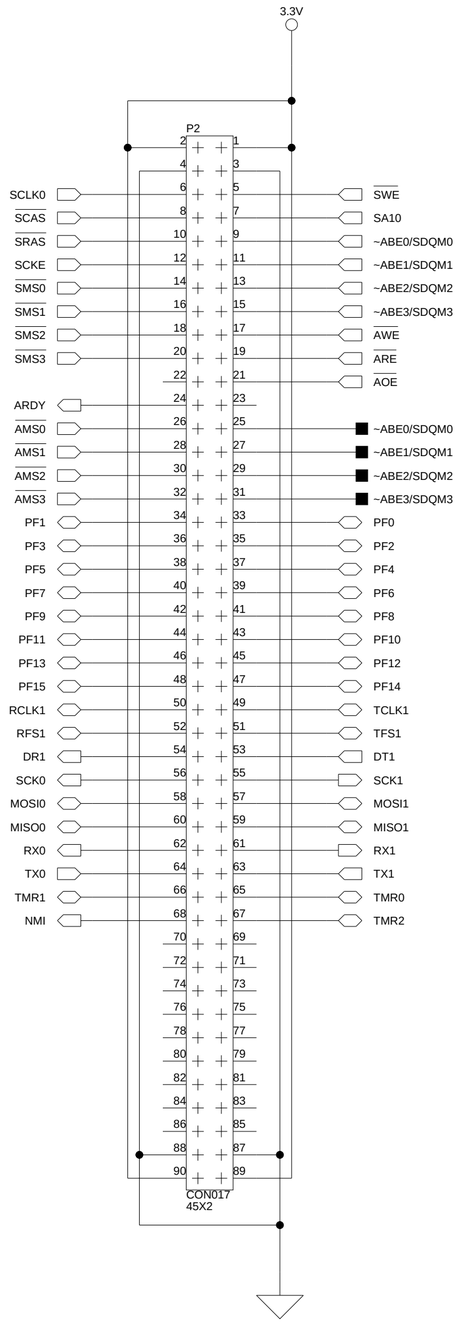
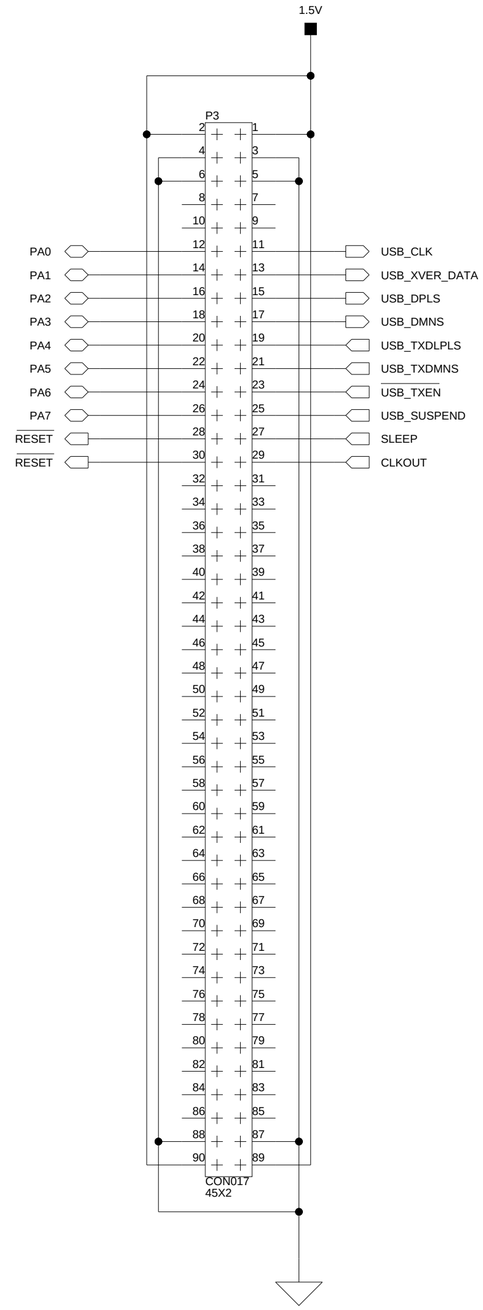
Title ADSP-BF535 EZ-KIT LITE - RESET/PB/LED

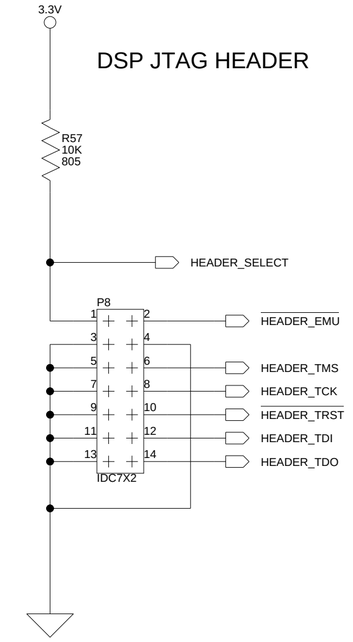
Size	Board No.	Rev
C	A0162-2000	1.6

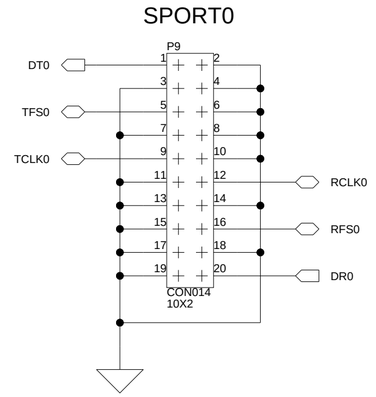
Date 3-13-2003_19:50 **Sheet** 6 **of** 12











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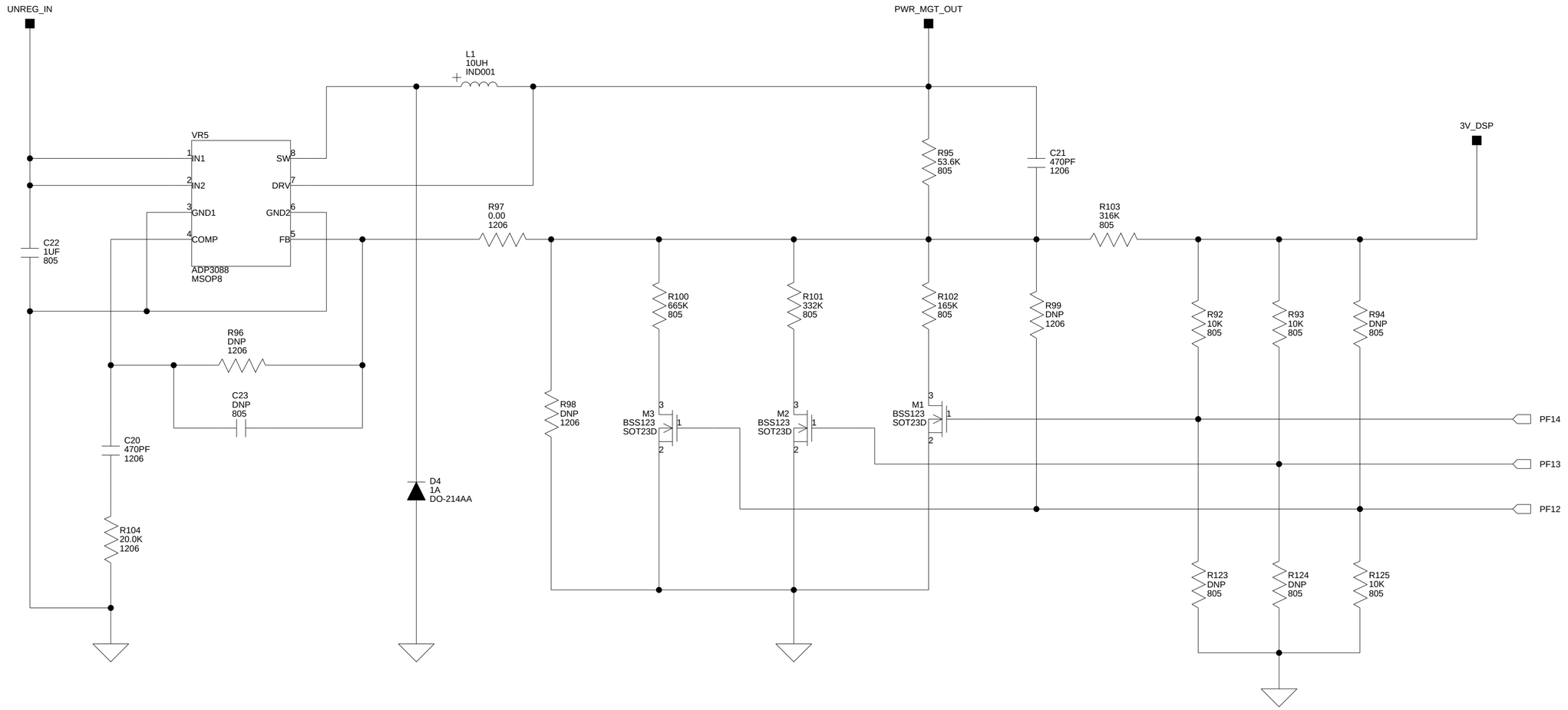
Engineering	

Title	ADSP-BF535 EZ-KIT LITE - CONNECTORS	
Size: C	Board No.: A0162-2000	Rev: 1.6
Date: 3-13-2003_19:50	Sheet 7 of 12	

PF14	PF13	PF12	VDD_INT	
1	1	1	1.6V	
1	1	0	1.5V	*
1	0	1	1.4V	
1	0	0	1.3V	
0	1	1	1.2V	
0	1	0	1.1V	
0	0	1	1.0V	
0	0	0	0.9V	

* = DEFAULT
WAIT 100uS FOR VOLTAGE TO SETTLE
AFTER CHANGING PF11-9



Approvals	Date
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Nashua, NH 03063
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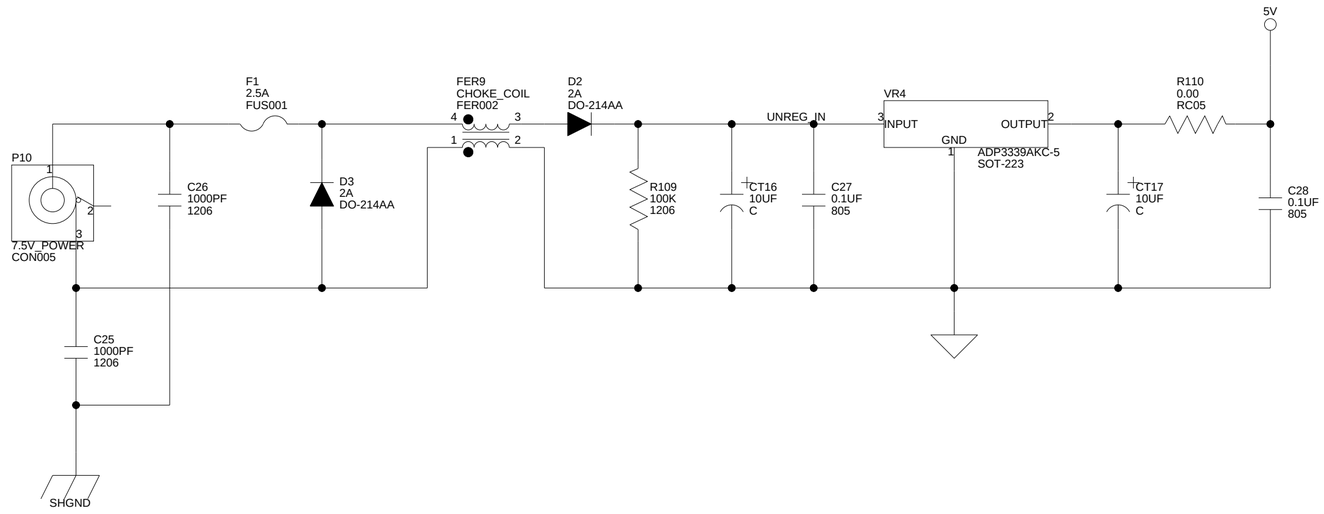
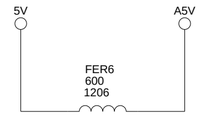
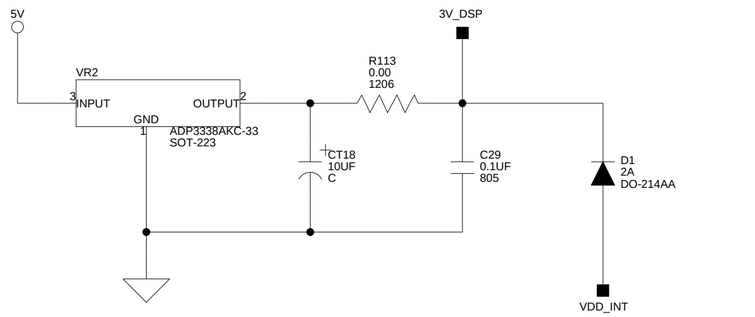
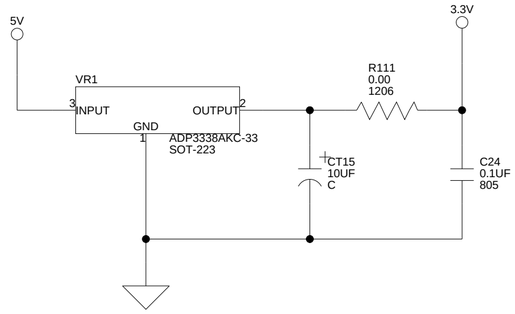
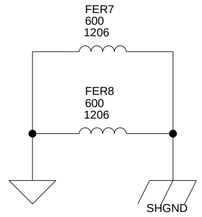
Title	ADSP-BF535 EZ-KIT LITE - POWER 1		
Size C	Board No. A0162-2000		Rev 1.6
Date 3-12-2003_15:48		Sheet 8 of 12	

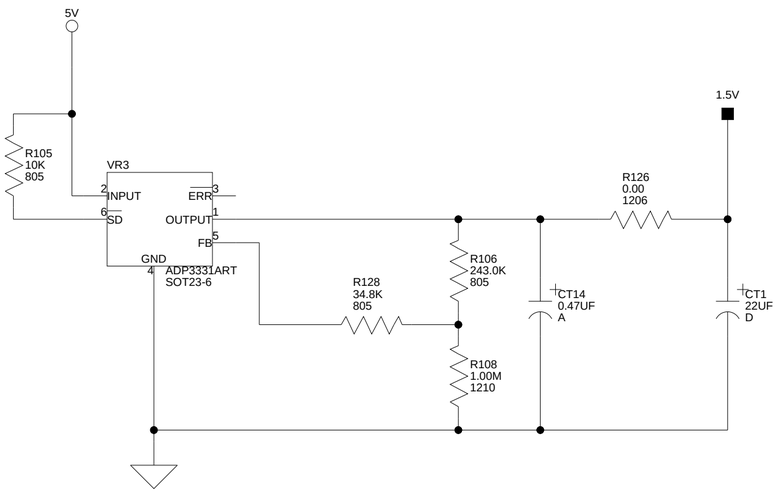


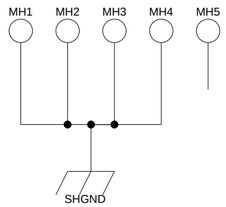












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Title: ADSP-BF535 EZ-KIT LITE - POWER 2		
Size: C	Board No.: A0162-2000	Rev: 1.6
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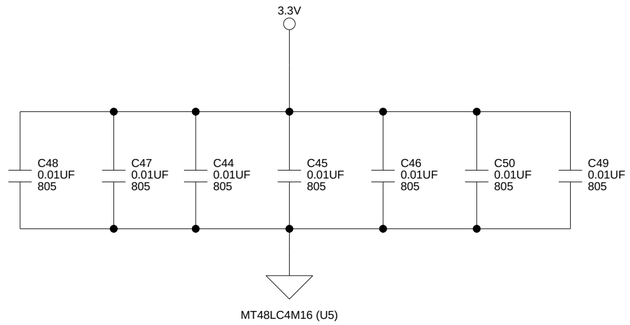

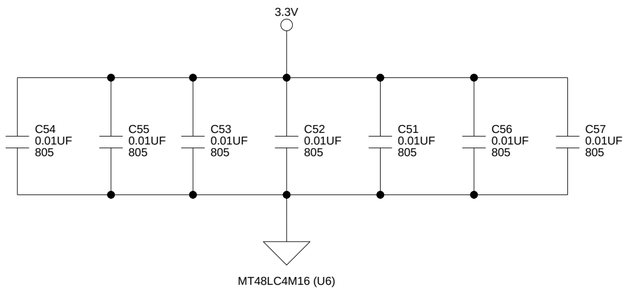

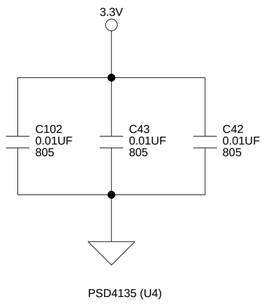

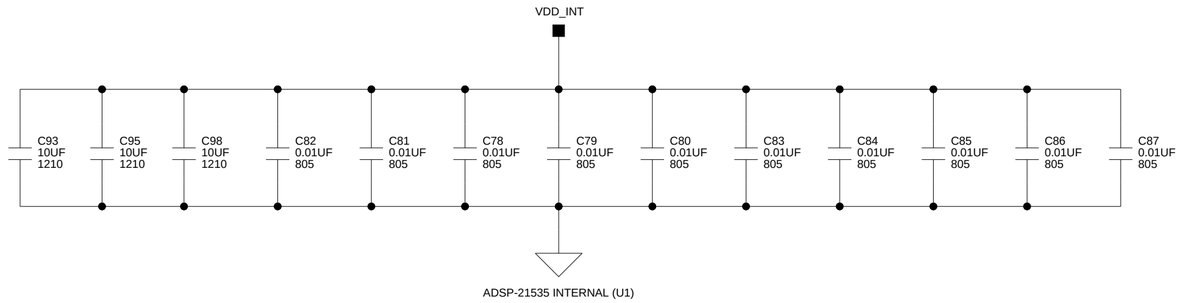

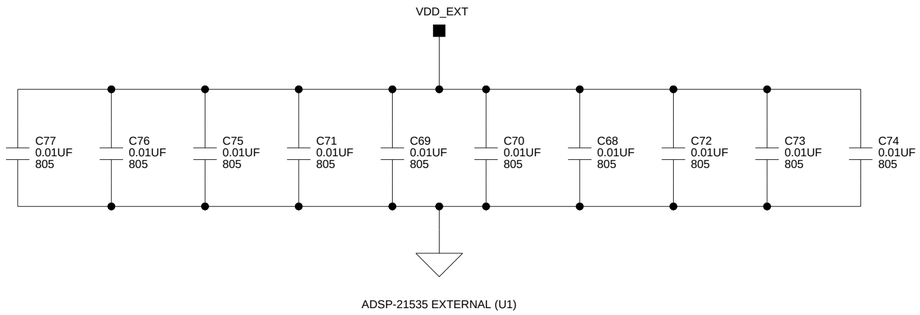

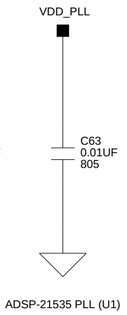

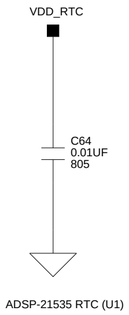

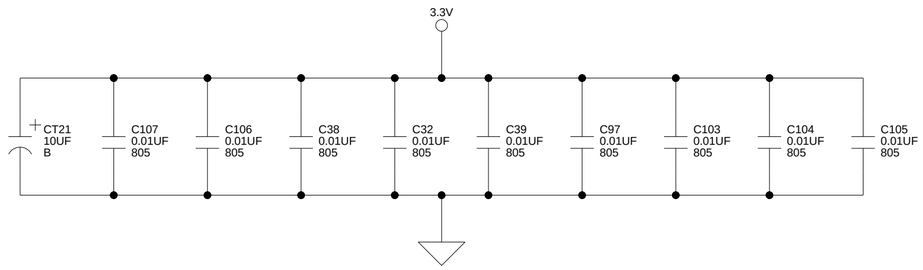

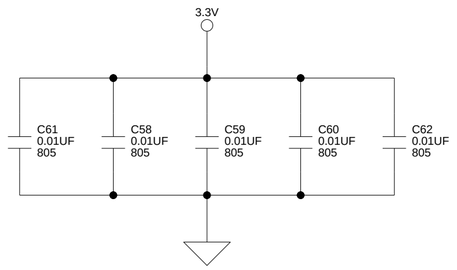

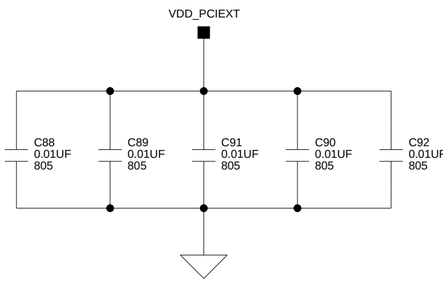

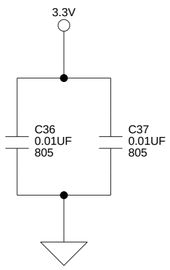

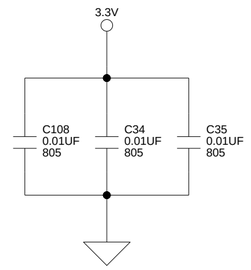

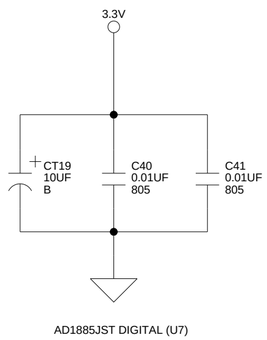

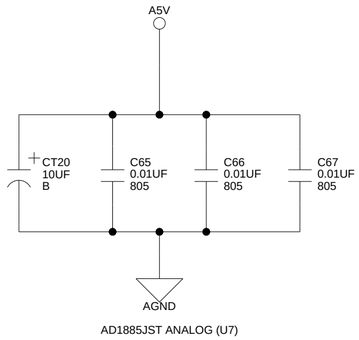

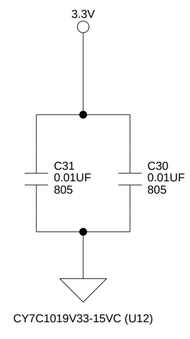

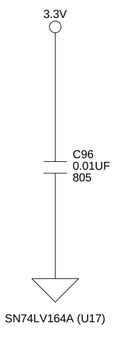

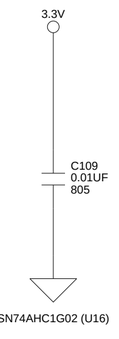

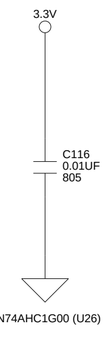

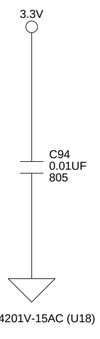

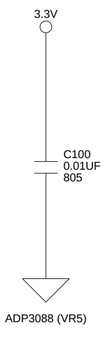

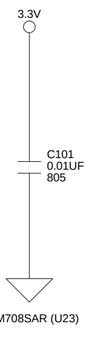

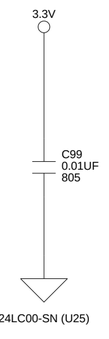

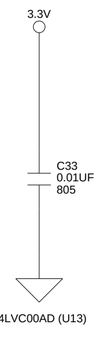

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Title ADSP-BF535 EZ-KIT LITE - BYPASS CAPS

Size	Board No.	Rev
C	A0162-2000	1.6

Date	Sheet	of
3-12-2003_15:48	10	12

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

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

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Title	ADSP-BF535 EZ-KIT LITE - USB INTERFACE	
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