Blackfin®/SHARC® USB EZ-Extender® Manual

Revision 1.1, July 2012

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Analog Devices, Inc.
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ANALOG DEVICES

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Regulatory Compliance

The Blackfin/SHARC USB EZ-Extender is designed to be used solely in a laboratory environment. The board is not intended for use as a consumer end product or as a portion of a consumer end product. The board is an open system design which does not include a shielded enclosure and therefore may cause interference to other electrical devices in close proximity. This board should not be used in or near any medical equipment or RF devices.

The Blackfin/SHARC USB EZ-Extender is currently being processed for certification that it complies with the essential requirements of the European EMC directive 89/336/EEC amended by 93/68/EEC and therefore carries the "**CE**" mark.

The Blackfin/SHARC USB EZ-Extender 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 unused extender boards in the protective shipping package.

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PREFACE

Thank you for purchasing the Blackfin/SHARC USB EZ-Extender®, Analog Devices, Inc. extender board to the EZ-Board® evaluation system for the ADSP-BF518F, ADSP-BF526 Blackfin®, and ADSP-21469 SHARC® processors.

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 characteristics towards delivering signal processing performance in a microprocessor-like environment.

SHARC processors are based on a 32-bit super Harvard architecture that includes a unique memory architecture comprised of two large on-chip, dual-ported SRAM blocks coupled with a sophisticated IO processor, which gives a SHARC processor the bandwidth for sustained high-speed computations. SHARC processors represents today's de facto standard for floating-point processing, targeted toward premium audio applications.

The EZ-Board and Blackfin/SHARC USB EZ-Extender are designed to be used in conjunction with the CrossCore® Embedded Studio (CCES) and VisualDSP++® software development environments. The development environment facilitates advanced application code development and debug, such as:

- Create, compile, assemble, and link application programs written in C++, C, and Blackfin/SHARC USB EZ-Extender assembly
- Load, run, step, halt, and set breakpoints in application programs

- Read and write data and program memory
- Read and write core and peripheral registers
- Plot memory

To learn more about Analog Devices development software, go to http://www.analog.com/processors/tools.

Product Overview

The Blackfin/SHARC USB EZ-Extender is a separately sold extender board that plugs onto the expansion interface of the ADSP-BF518F, ADSP-BF526, and ADSP-21469 EZ-Board evaluation systems. The extender board aids the design and prototyping phases of the ADSP-BF518F, ADSP-BF526, and ADSP-21469 processor targeted applications.

The board extends the capabilities of the evaluation system by providing a connection between the asynchronous memory bus of the Blackfin/SHARC processor and a USB 2.0 device.

Please visit www.analog.com/EX2-USB for additional information, including CCES support.

The following is a list of the Blackfin/SHARC USB EZ-Extender interfaces.

- USB 2.0 interface:
  - PLX Technology NET2272 device
  - USB driver and application code
- No power supply required: derives power from the EZ-Board
- CE certified

Before using any of the interfaces, follow the setup procedure in "Blackfin/SHARC USB EZ-Extender Setup" on page 1-1.

Example programs are available to demonstrate capabilities of the Blackfin/SHARC USB EZ-Extender board.

Purpose of This Manual

The *Blackfin/SHARC USB EZ-Extender Manual* provides instructions for installing the product hardware (board). The text describes operation and configuration of the board components. Finally, a schematic and a bill of materials are provided as a reference for future designs.

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 that describe your target architecture. For the locations of these documents, see "Related Documents".

Programmers who are unfamiliar with CCES or VisualDSP++ should refer to the online help and user's manuals.

Manual Contents

The manual consists of:

- Chapter 1, "Blackfin/SHARC USB EZ-Extender Interfaces" on page 1-1
  Provides basic board information.
- Chapter 2, "Blackfin/SHARC USB EZ-Extender Hardware Reference" on page 2-1
  Provides information on the hardware aspects of the board.
- Appendix A, "Blackfin/SHARC USB EZ-Extender Bill of Materials" on page A-1
  Provides a list of components used to manufacture the EZ-Extender board.
- Appendix B, "Blackfin/SHARC USB EZ-Extender Schematic" on page B-1
  Provides the resources to allow EZ-Board board-level debugging or to use as a reference design.

What's New in This Manual

This is revision 1.1 of the *Blackfin/SHARC USB EZ-Extender Manual*. The manual has been updated to include CCES information. In addition, modifications and corrections based on errata reports against the previous manual revision have been made.

For the latest version of this manual, please refer to the Analog Devices Web site.

Technical Support

You can reach Analog Devices processors and DSP technical support in the following ways:

- Post your questions in the processors and DSP support community at EngineerZone®:
  `http://ez.analog.com/community/dsp`
- Submit your questions to technical support directly at:
  `http://www.analog.com/support`
- E-mail your questions about processors, DSPs, and tools development software from **CrossCore Embedded Studio** or **VisualDSP++**:

  Choose **Help > Email Support**. This creates an e-mail to `processor.tools.support@analog.com` and automatically attaches your **CrossCore Embedded Studio** or **VisualDSP++** version information and `license.dat` file.
- E-mail your questions about processors and processor applications to:
  `processor.support@analog.com` or
  `processor.china@analog.com` (Greater China support)
- In the **USA only**, call **1-800-ANALOGD** (1-800-262-5643)
- Contact your Analog Devices sales office or authorized distributor. Locate one at:
  `www.analog.com/adi-sales`

- Send questions by mail to:
  Processors and DSP Technical Support
  Analog Devices, Inc.
  Three Technology Way
  P.O. Box 9106
  Norwood, MA 02062-9106
  USA

Supported Products

The Blackfin/SHARC USB EZ-Extender is designed as an extender board to the ADSP-BF518F, ADSP-BF526, and ADSP-21469 EZ-Board evaluation systems.

Product Information

Product information can be obtained from the Analog Devices Web site and the online help.

Analog Devices Web Site

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

To access a complete technical library for each processor family, go to http://www.analog.com/processors/technical_library. The manuals selection opens a list of current manuals related to the product as well as a link to the previous revisions of the manuals. When locating your manual title, note a possible errata check mark next to the title that leads to the current correction report against the manual.

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

Visit MyAnalog to sign up. If you are a registered user, just log on. Your user name is your e-mail address.

EngineerZone

EngineerZone is a technical support forum from Analog Devices. It allows you direct access to ADI technical support engineers. You can search FAQs and technical information to get quick answers to your embedded processing and DSP design questions.

Use EngineerZone to connect with other DSP developers who face similar design challenges. You can also use this open forum to share knowledge and collaborate with the ADI support team and your peers. Visit http://ez.analog.com to sign up.

Related Documents

For additional information about the product, refer to the following publications.

Table 1. Related Processor Publications

Title	Description
• *ADSP-BF512/ADSP-BF514/ADSP-BF516/ ADSP-BF518(F) Blackfin Embedded Processor Data Sheet* • *ADSP-BF522/ADSP-BF523/ADSP-BF524/ ADSP-BF525/ADSP-BF526/ADSP-BF527 Blackfin Embedded Processor Data Sheet* • *ADSP-21467/ADSP-21469 SHARC Processor Data Sheet*	General functional description, pinout, and timing of the processor
• *ADSP-BF51x Blackfin Processor Hardware Reference* • *ADSP-BF52x Blackfin Processor Hardware Reference* • *ADSP-214xx SHARC Processor Hardware Reference*	Description of the internal processor architecture and all register functions
• *Blackfin Processor Programming Reference* • *SHARC Processor Programming Reference*	Description of all allowed processor assembly instructions

1 BLACKFIN/SHARC USB EZ-EXTENDER INTERFACES

This chapter provides the setup procedures for both the Blackfin/SHARC USB EZ-Extender and EZ-Board (ADSP-BF518F, ADSP-BF526, or ADSP-21469) and describes the interfaces the extender supports.

The information is presented in the following order.

- "Blackfin/SHARC USB EZ-Extender Setup" on page 1-1
- "USB 2.0 Interface" on page 1-2

Blackfin/SHARC USB EZ-Extender Setup

It is very important to set up all components of the system containing the Blackfin/SHARC USB EZ-Extender, then apply power to the system. The following procedure is recommended for correct setup.

Power your system after these steps are completed:

1. Read the applicable design interface section in this chapter—the text provides an overview of the interface capabilities.
2. Read "System Architecture" on page 2-2 to understand physical connections of the extender board. For detailed information, refer to "Blackfin/SHARC USB EZ-Extender Schematic" on page B-1.
3. Set the jumpers on the Blackfin/SHARC USB EZ-Extender board. Use the block diagram in Figure 2-1 on page 2-2 in conjunction with "Jumper Settings" on page 2-2.

4. Set the switches and jumpers on the EZ-Board. If not already, familiarize yourself with the EZ-Board documentation and schematic drawings (see "Product Information").

   Compare the expansion interface signals of the Blackfin/SHARC USB EZ-Extender board with the EZ-Board signals to ensure there is no contention. For example, it may be necessary to disable other devices connected to the expansion interface of the processor and disable peripherals on the EZ-Board.

5. Install the Blackfin/SHARC USB EZ-Extender on the EZ-Board via the high speed expansion interface.

USB Software

For information about USB software, refer to the readme text files in the `Examples` folder of the installation directory.

USB 2.0 Interface

The Blackfin/SHARC USB EZ-Extender enables a connection between a USB 2.0 chip and Blackfin/SHARC processor without any other programmable logic. The PLX Technology's NET2272 controller ties directly to the asynchronous memory bus of the Blackfin or SHARC processor. You can read from and write to the USB 2.0 controller by addressing the named memory bank directly.

You can reset the NET2272 controller by asserting `LOW` one of the four GPIO signals of the expansion interface. Refer to the appropriate EZ-Board manual to learn how the GPIO signals connect to the processor.

The USB `IRQ` signal of the NET2272 controller connects to one of the four GPIO signals on the expansion interface. Refer to the appropriate

EZ-Board document to learn how the GPIO signals connect to the processor.

The USB `CS` signal of the NET2272 controller connects to one of the four `AMS` signals on the expansion interface. Refer to the appropriate EZ-Board manual to learn how the `AMS` signals connect to the processor.

The jumper settings required for each of the respective EZ-Boards are described in the readme text files in the `Examples` folder of the installation directory. The readme file describes the USB software, source code, drivers, and explains how to run a USB-based application.

2 BLACKFIN/SHARC USB EZ-EXTENDER HARDWARE REFERENCE

This chapter describes the hardware design of the Blackfin/SHARC USB EZ-Extender.

The following topics are covered.

- "System Architecture" on page 2-2
  Describes the board configuration and explains how the board components interface with the processor and EZ-Board.
- "Jumper Settings" on page 2-2
  Describes the on-board configuration jumpers.

System Architecture

A block diagram of the Blackfin/SHARC USB EZ-Extender is shown in Figure 2-1.

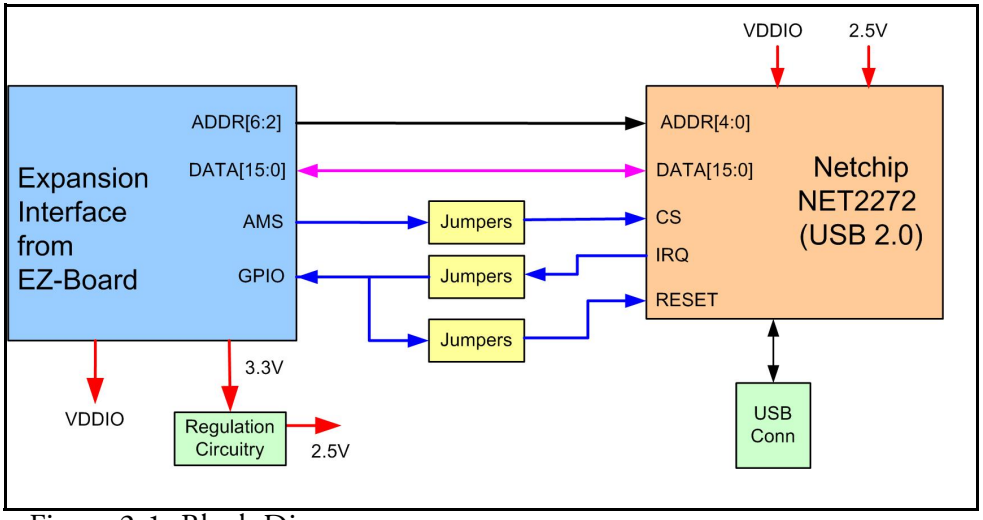


Figure 2-1. Block Diagram

Jumper Settings

Before using the Blackfin/SHARC USB EZ-Extender, follow the setup procedure in "Blackfin/SHARC USB EZ-Extender Setup" on page 1-1.

Figure 2-2 shows the locations of all jumper headers. A two-pin jumper can be placed on the respective jumper header for different functionality. The following sections describe all possible jumper settings and associated functionality.

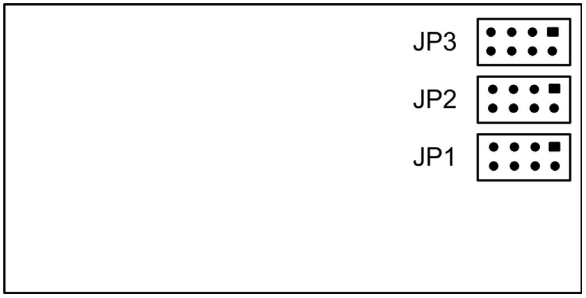


Figure 2-2. Jumper Locations

USB Chip Select Jumper (JP1)

The USB chip select jumper (JP1) connects an AMS signal from the EZ-Board to the chip select input on the NET2272 controller. The AMS0-3 signals are available. By default, the jumper is installed on pins 7 and 8, which connect AMS3 to the chip select signal.

USB IRQ Jumper (JP2)

The USB IRQ jumper (JP2) connects a general-purpose IO signal from the EZ-Board to the interrupt output on the NET2272 controller. The GPIO1-4 signals are available. By default, the jumper is installed on pins 1 and 2, which connect GPIO1 to the interrupt signal.

USB Soft Reset Jumper (JP3)

The soft reset jumper (JP3) connects a general-purpose signal from the EZ-Board to the reset input on the NET2272 controller. GPIO1-4 are available. By default, the jumper is installed on pins 7 and 8, which connect GPIO4 to the reset signal.

A BLACKFIN/SHARC USB EZ-EXTENDER BILL OF MATERIALS

The bill of materials corresponds to "Blackfin/SHARC USB EZ-Extender Schematic" on page B-1.

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
1	1	SN74LVC1G08 SOT23-5	U2	TI	SN74LVC1G08DBVR
2	1	NET2272 TQFP64	U1	NET CHIP	NET2272REV1A-LF
3	1	30MHZ OSC010	Y1	ECLIPTEK	E2SAA10-30.000M
4	1	ADP130AUJZ-2.5 TSOT5	VR1	ANALOG DEVICES	ADP130AUJZ-2.5-R7
5	3	IDC 2PIN_JUMPER_ SHORT	SJ1-3	DIGI-KEY	S9001-ND
6	1	USB_MINI-B 5PIN CON046	P2	MOLEX	54819-0519
7	3	IDC 4X2 IDC4X2	JP1-3	SULLINS	GEC04DAAN
8	1	QFS 52x2 QFS52x2_SMT	P1	SAMTEC	QFS-052-04.25-L-D-A
9	2	1UF 16V 10% 0805	C4-5	KEMET	C0805C105K4RAC TU
10	1	47.0K 1/10W 1% 0805	R2	VISHAY	CRCW080547K0FKEA
11	1	42 100MHZ 4A 0805	FER1	DIGI-KEY	587-1768-2-ND
12	3	10UF 6.3V 10% 0805	C8,C11,C17	AVX	08056D106KAT2A

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
13	11	0.01UF 16V 10% 0402	C2,C6-7,C9-10, C12-16,C18	AVX	0402YC103KAT2A
14	7	10K 1/16W 5% 0402	R8-14	VISHAY	CRCW040210K0FKED
15	2	10PF 50V 5% 0805	C1,C3	AVX	08055A100JAT2A
16	1	1.5K 1/10W 5% 0603	R6	PANASONIC	ERJ-3GEYJ152V
17	2	39.0 1/10W 1% 0603	R4,R7	VISHAY	CRCW-060339R0FKEA
18	1	2.43K 1/10W 1% 0805	R1	DIGI-KEY	311-2.43KCRTR-ND
19	1	330 1/10W 5% 0603	R16	VISHAY	CRCW0603330RJNEA
20	1	1M 1/10W 5% 0603	R5	VISHAY	CRCW06031M00FNEA
21	1	GREEN LED001	LED1	PANASONIC	LN1361CTR
22	1	15KV PGB1010603 0603	D1	LITTLEFUSE	PGB1010603MR
23	2	1.0K 1/16W 1% 0402	R3,R15	PANASONIC	ERJ-2RKF1001X
24	2	330 100MHZ 1.5A 0805	FER2-3	MURATA	BLM21PG331SN1D

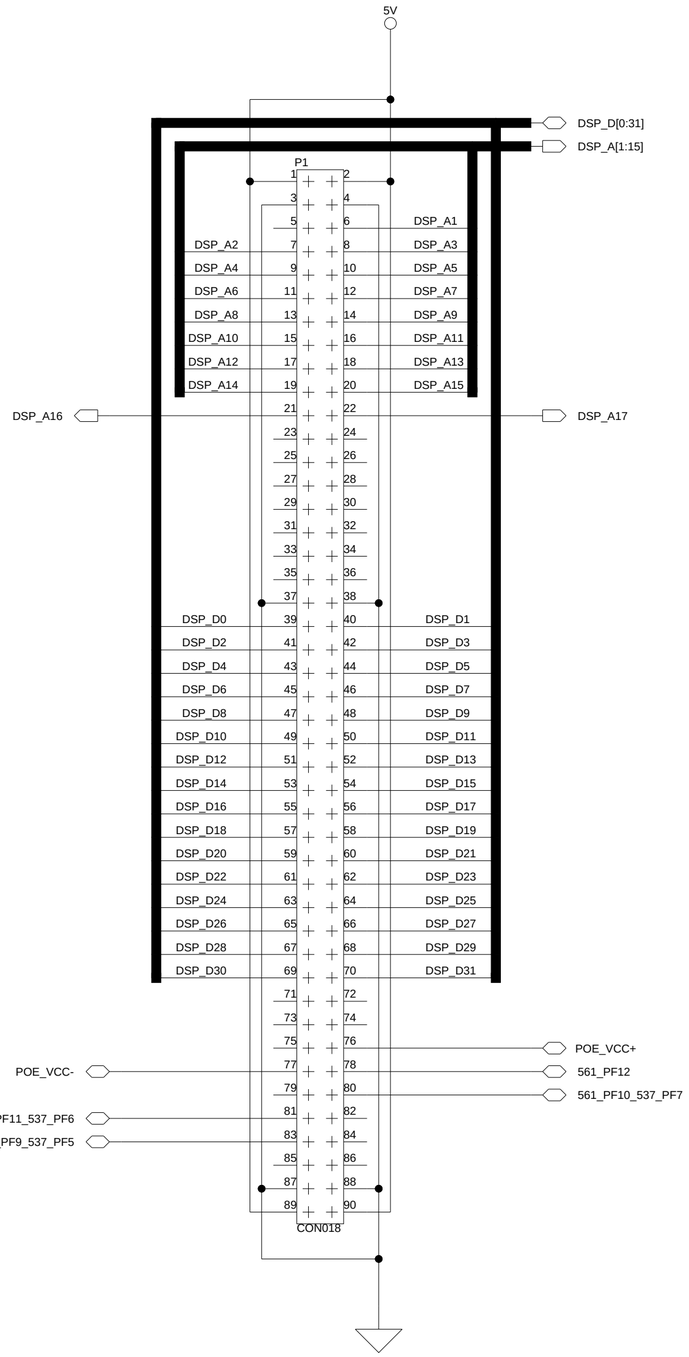
BLACKFIN USB-LAN EZ-EXTENDER

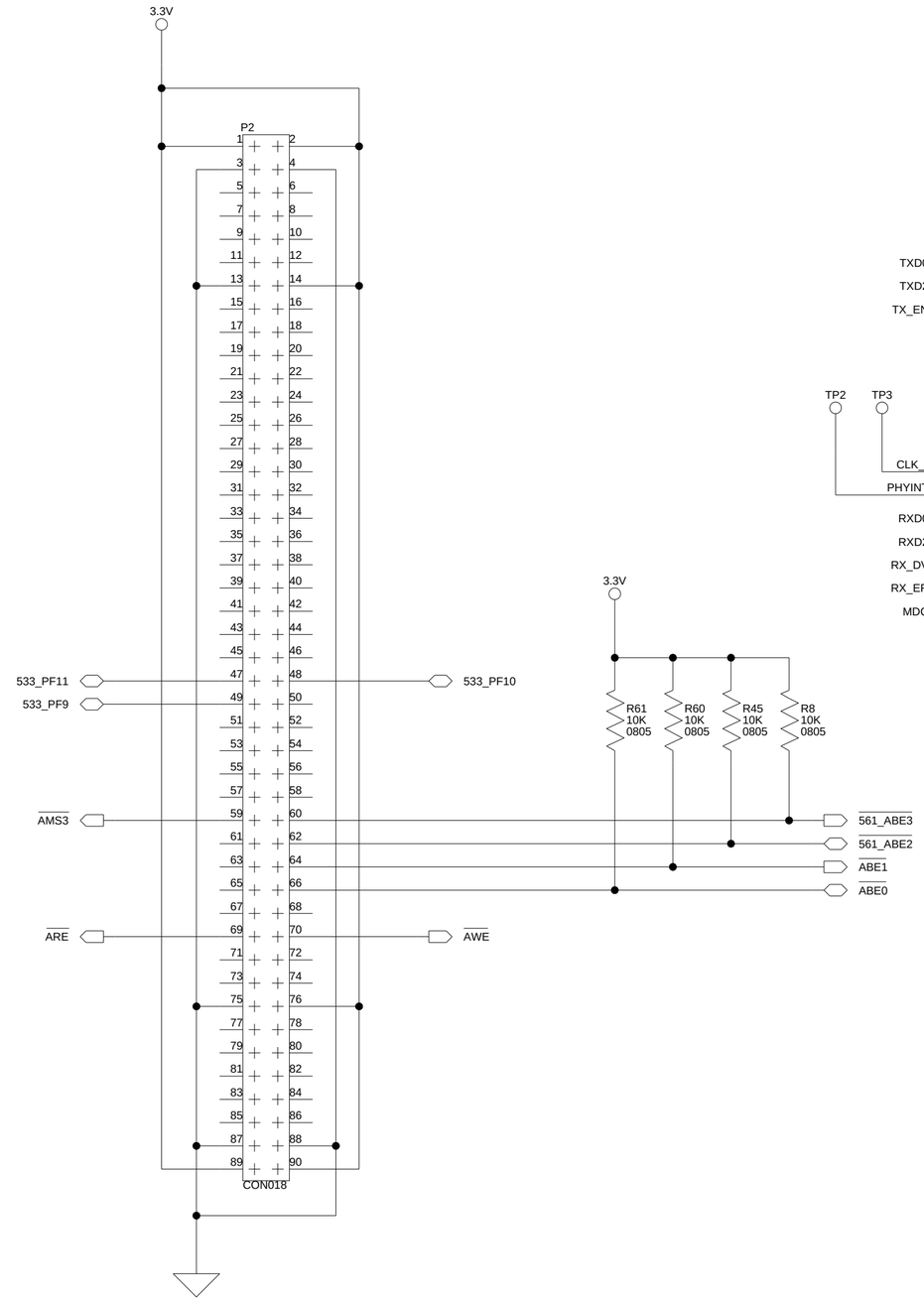
SCHEMATIC

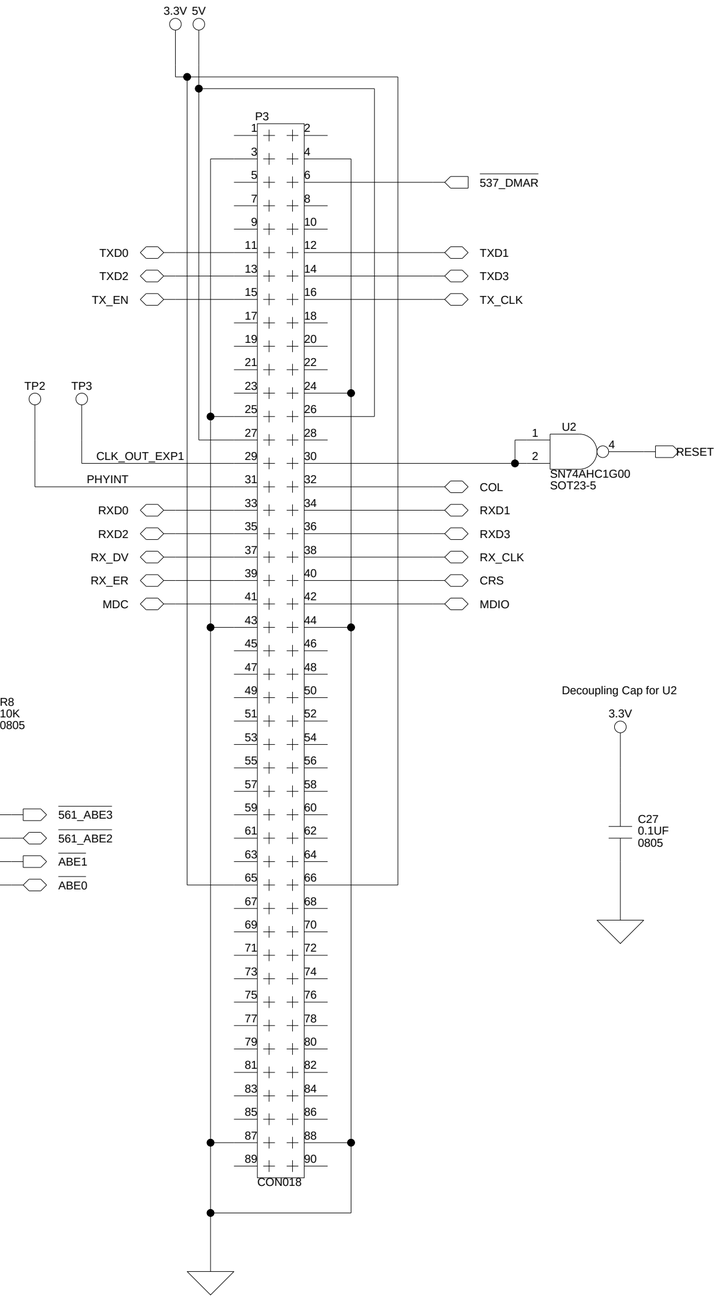
ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

Title	BLACKFIN USB-LAN EZ-EXTENDER TITLE		
Size C	**Board No.** A0187-2003		**Rev** 2.1
Date 10-11-2007_16:18		**Sheet** 1 **of** 6	

EXPANSION INTERFACE (TYPE B)







ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
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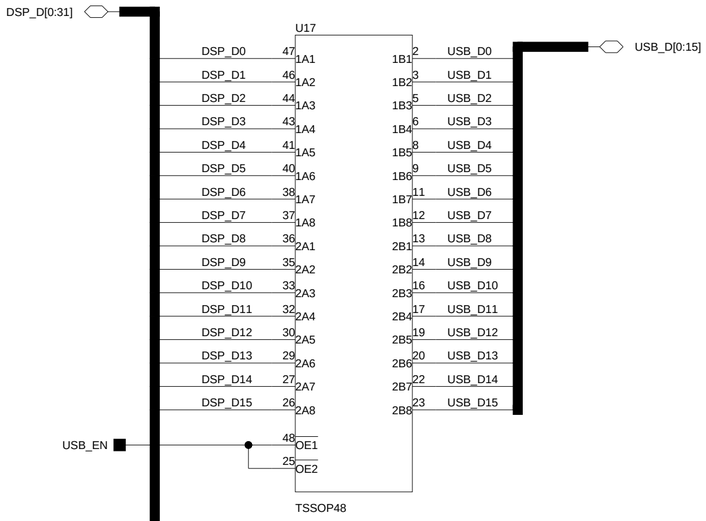
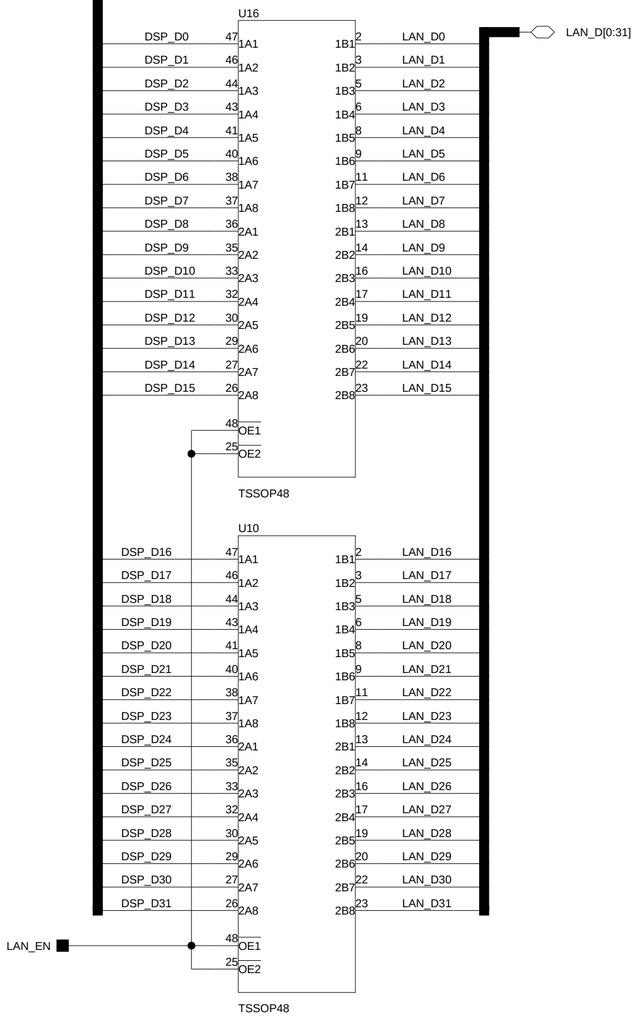
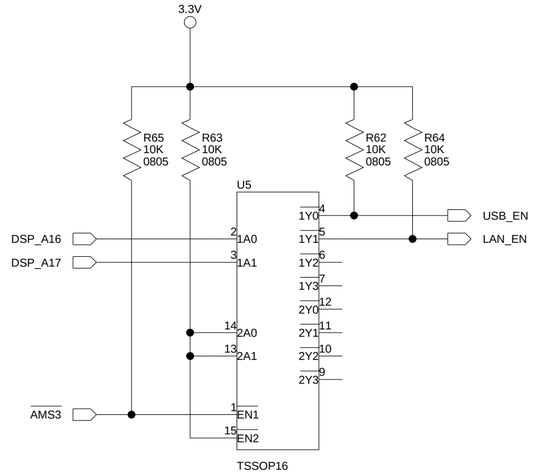
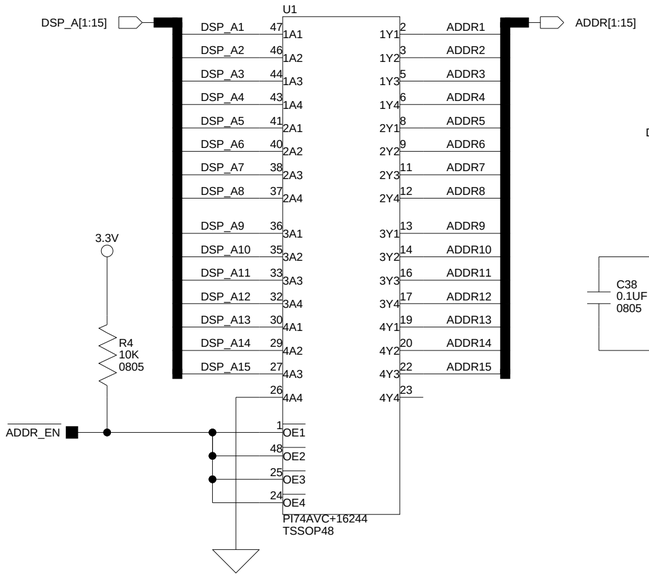
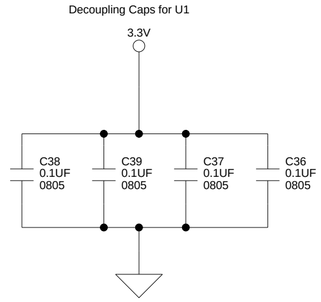
Size C	**Board No.** A0187-2003	**Rev** 2.1
Date 10-11-2007_16:18	**Sheet** 2 **of** 6	

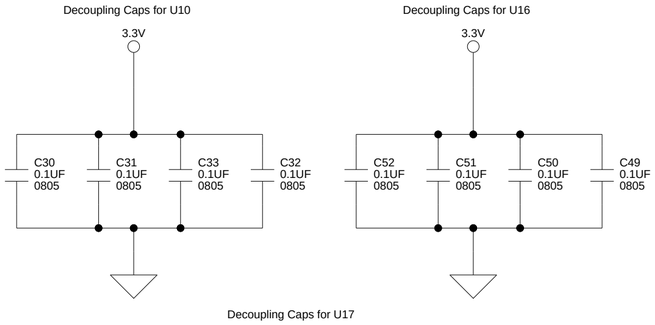


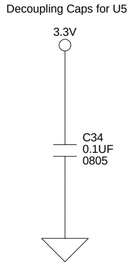


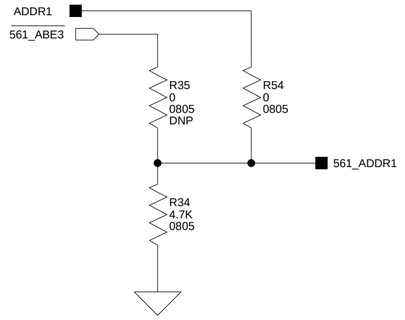












	* SW1.1 ON	SW1.1 OFF
ADDR_EN	U1 ENABLED	U1 HI-Z

	* SW1.2 ON	SW1.2 OFF
FLAG_EN	U12 ENABLED	U12 HI-Z

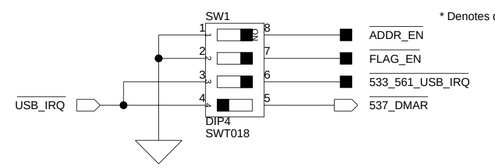
SEL=0 FOR BF561 USE

SEL=0 FOR BF537 USE

SEL=1 FOR BF533 USE

	SW1.3	SW1.4
533 OPERATION	* ON	* OFF
561 OPERATION	ON	OFF
537 OPERATION	ON	OFF

DEFAULT SETTING = ON



* Denotes default position

A17	A16	BF561 DSP ADDR RANGE	PERIPHERAL
0	0	0x2C00 0000 - 0x2C00 007F	USB
0	1	0x2C01 0000 - 0x2C01 FFFF	LAN
1	0	0x2C02 0000 - 0x2C02 FFFF	N/A
1	1	0x2C03 0000 - 0x2C03 FFFF	N/A

A17	A16	BF533/BF537 DSP ADDR RANGE	PERIPHERAL
0	0	0x2030 0000 - 0x2030 007F	USB
0	1	0x2031 0000 - 0x2031 FFFF	LAN
1	0	0x2032 0000 - 0x2032 FFFF	N/A
1	1	0x2033 0000 - 0x2033 FFFF	N/A

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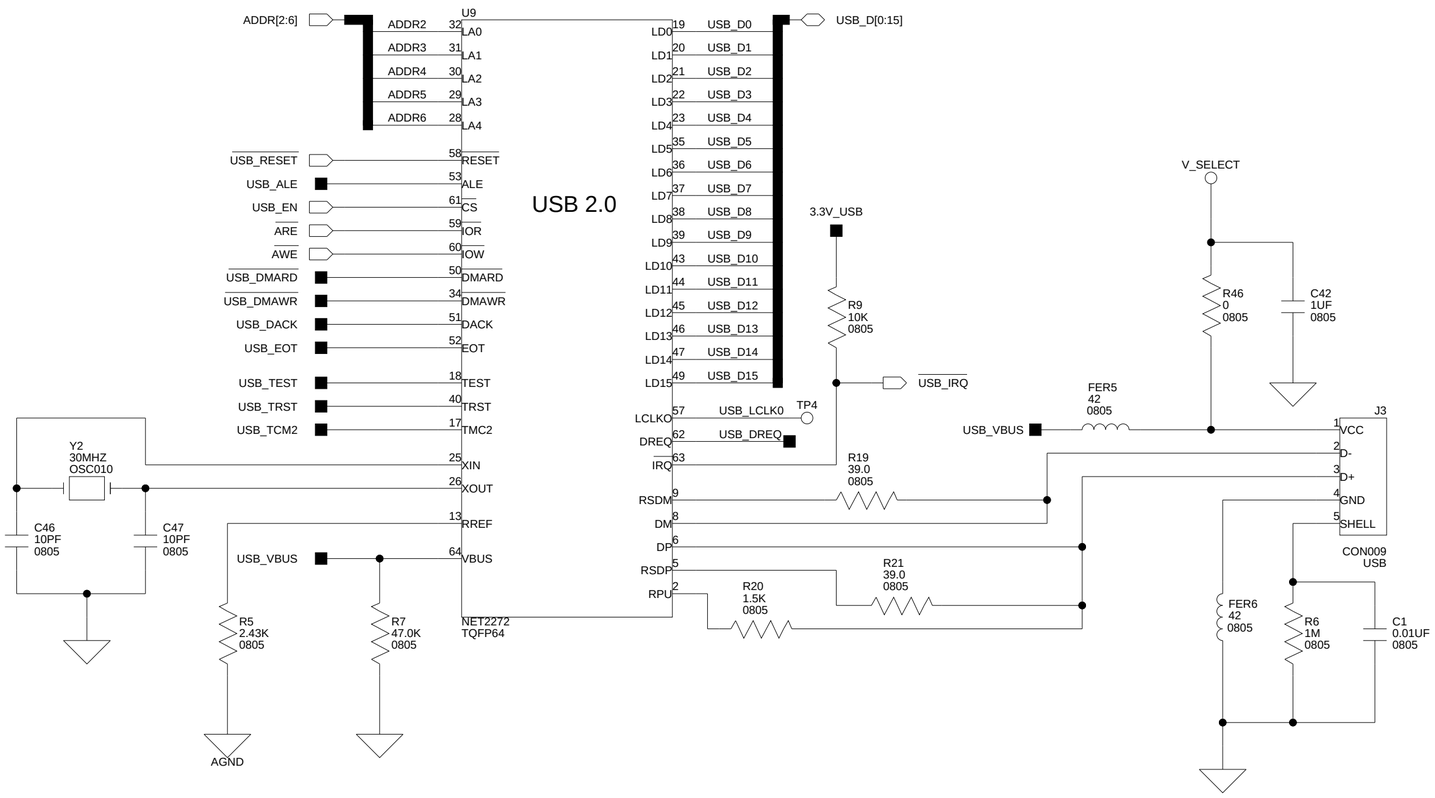
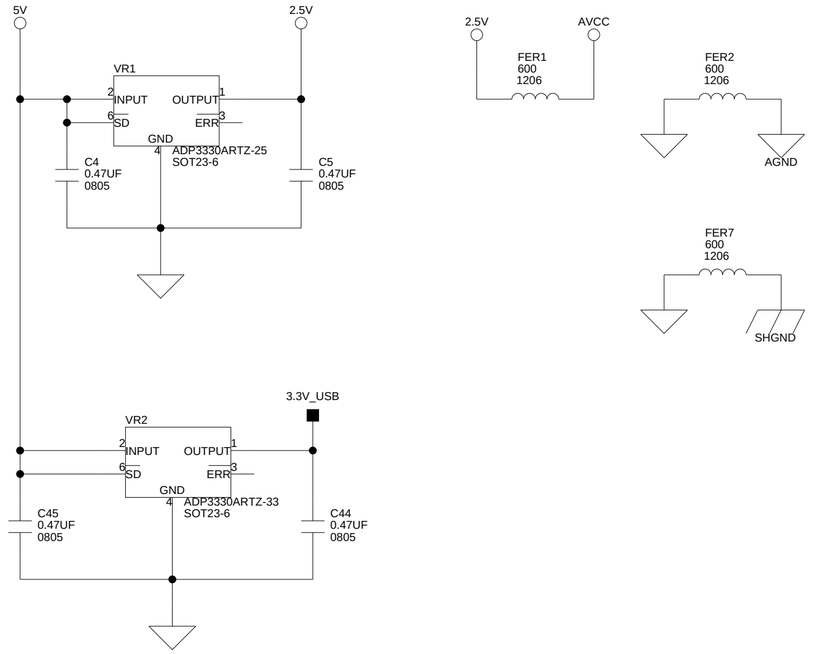
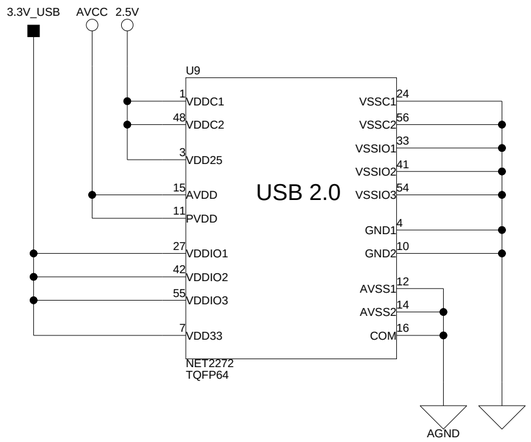
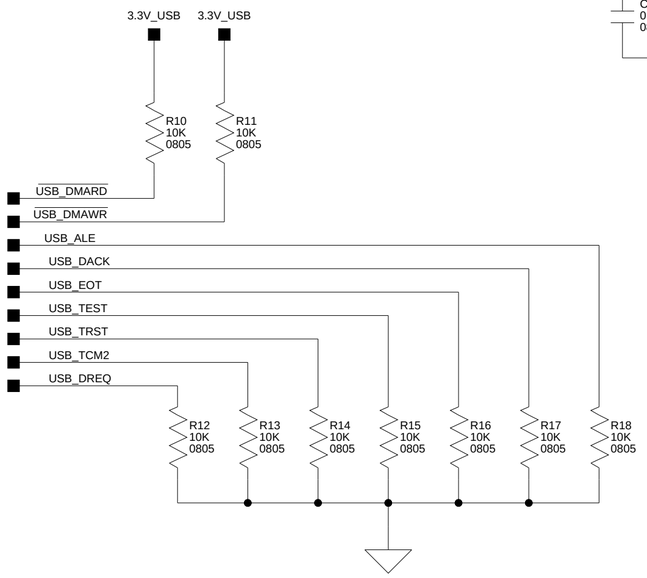
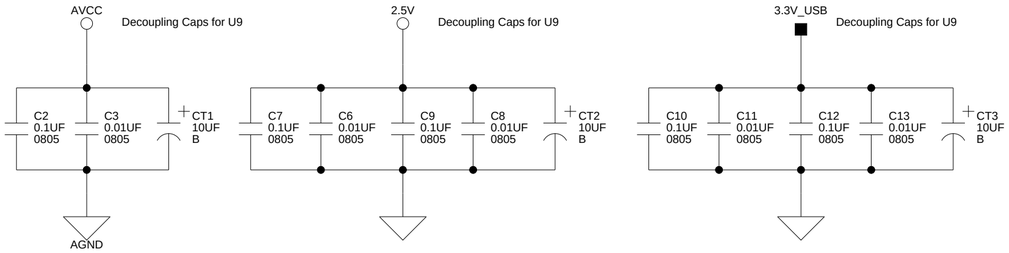
Title	BLACKFIN USB-LAN EZ-EXTENDER BUS SWITCHES	
Size C	Board No. A0187-2003	Rev 2.1
Date 10-11-2007_16:18	Sheet 3 of 6	



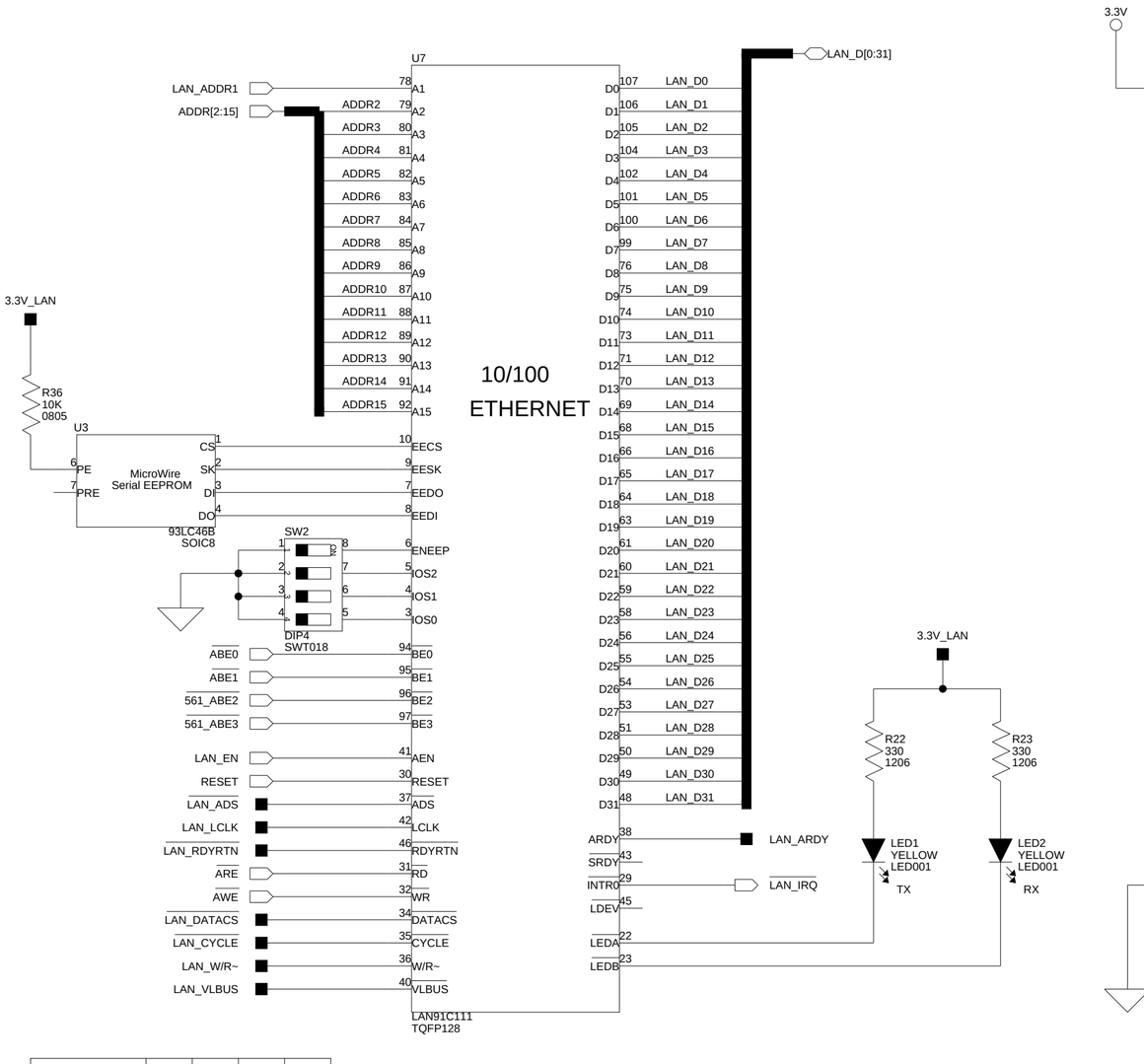


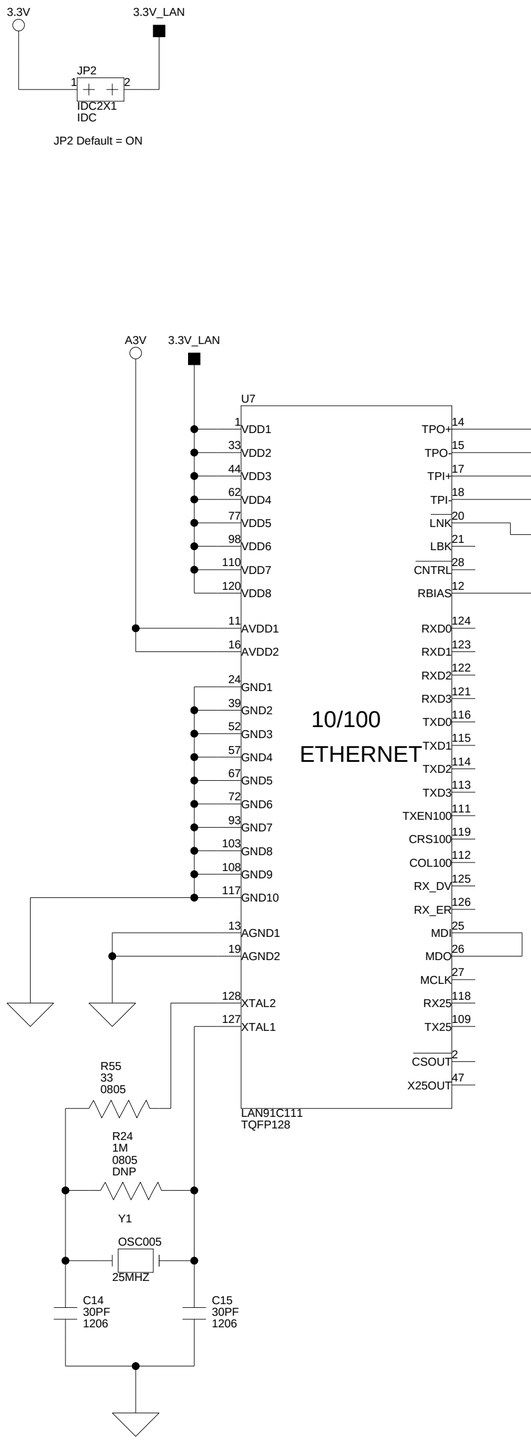


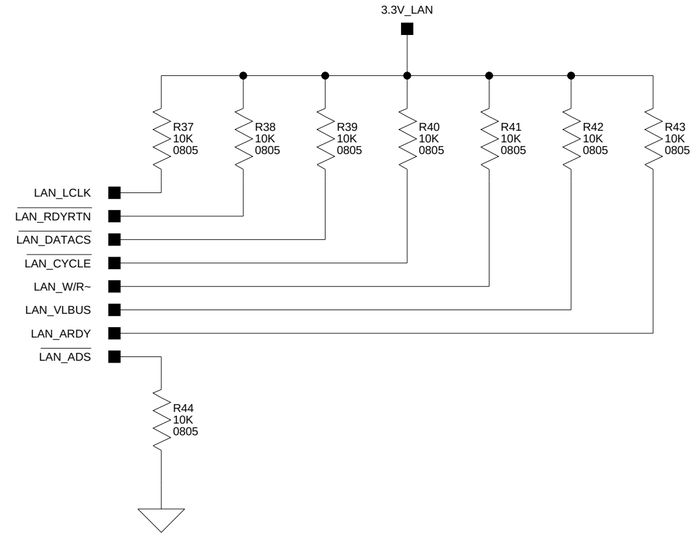




ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD		
Title	BLACKFIN USB-LAN EZ-EXTENDER USB		
Size C	**Board No.** A0187-2003		**Rev** 2.1
Date 10-11-2007_16:18		**Sheet** 4 **of** 6	







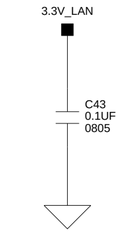
	SW2.1	SW2.2	SW2.3	SW2.4
EEPROM DISABLED	ON	X	X	X
* EEPROM ENABLED	OFF	X	X	X

* Denotes Default Setting

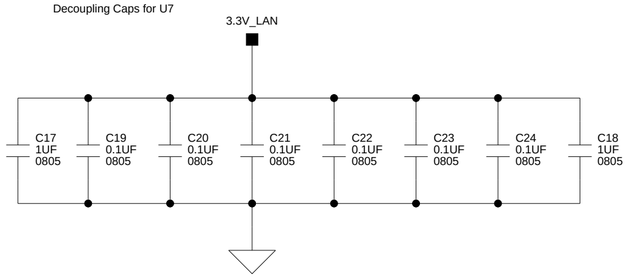
"X" DENOTES DON'T CARE VALUE

PLEASE REFER TO SMSC DATASHEET FOR MORE INFO ON IOS[2:0]

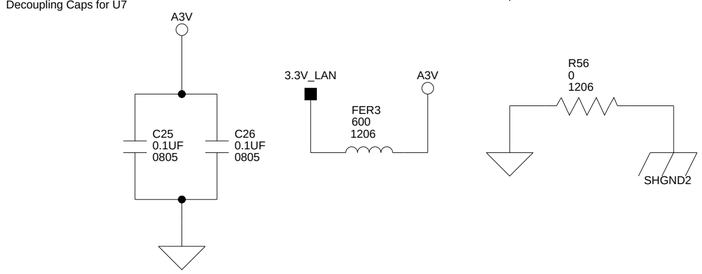
Decoupling Cap for U3



Decoupling Caps for U7



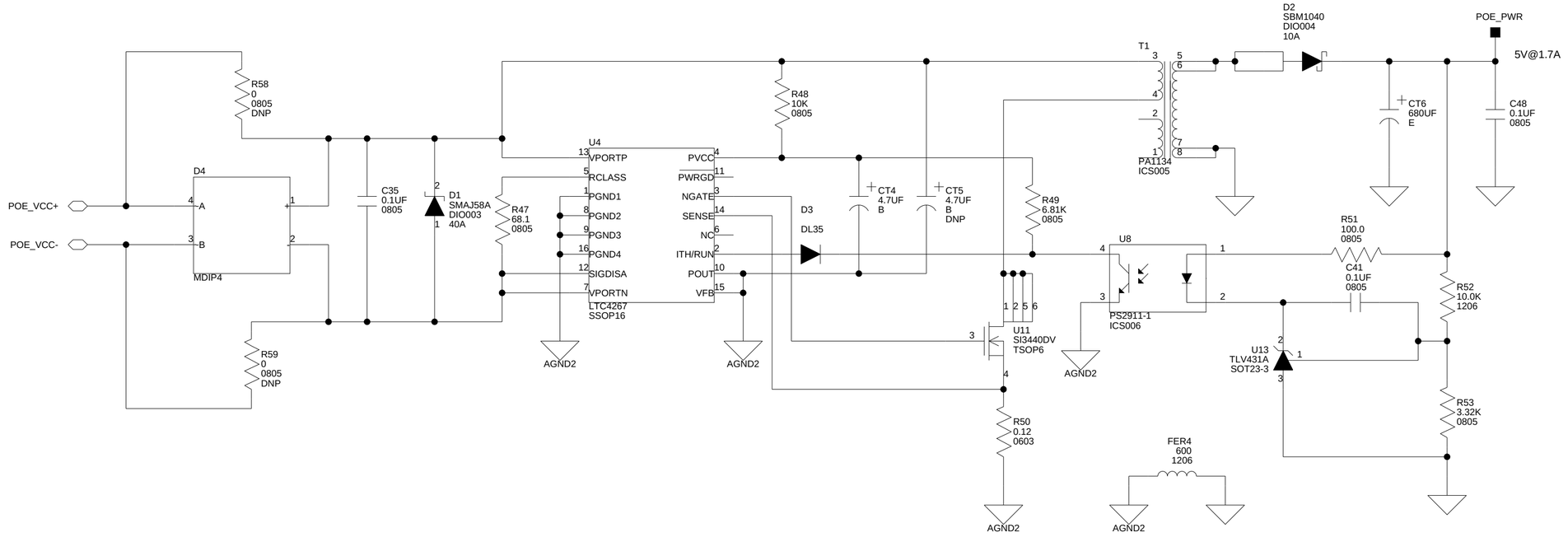
Decoupling Caps for U7



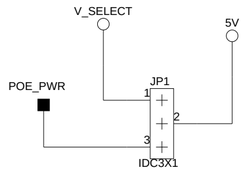
ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD		
Title	BLACKFIN USB-LAN EZ-EXTENDER LAN		
Size C	Board No. A0187-2003		Rev 2.1
Date 10-11-2007_16:18		Sheet 5 of 6	

POWER OVER ETHERNET CIRCUITRY

FOR USE WITH ADSP-BF537 EZ-KIT LITE ONLY



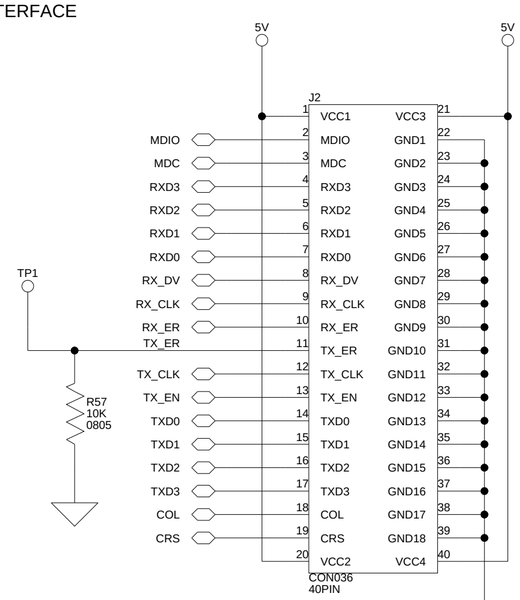
WARNING: THE EZ-KIT LITE MUST NOT BE POWERED WHEN THESE JUMPERS ARE POPULATED.



SOURCE OF 5V PWR	JP1 SETTING
EZ-KIT POWER	* NO JUMPER
USB TEST MODE	JP1 and JP2
POE POWER ADSP-BF537 EZ-KIT LITE ONLY	JP2 and JP3

*DENOTES DEFAULT SETTING

MII INTERFACE



FOR USE WITH ADSP-BF537 EZ-KIT LITE ONLY

ANALOG DEVICES

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

Title	BLACKFIN USB-LAN EZ-EXTENDER POE, MII, PWR SELECTION		
Size C	**Board No.** A0187-2003		**Rev** 2.1
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