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# **Blackfin/SHARC® USB EZ-Extender® Manual**

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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.



This 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 boards in the protective shipping package.





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# PREFACE

Thank you for purchasing the Blackfin/SHARC USB EZ-Extender<sup>®</sup>, Analog Devices, Inc. extender board to the EZ-Board<sup>™</sup> evaluation system for the ADSP-BF518F, ADSP-BF526 Blackfin<sup>®</sup>, and ADSP-21469 SHARC<sup>®</sup> 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 VisualDSP++<sup>®</sup> development environment. VisualDSP++ offers a powerful programming tool with new flexibility that significantly decreases the time required to port software code to a processor, reducing time-to-market.

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.

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 1-2](#).

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 (such as the *Hardware Reference* and *Instruction Set Reference*) that describe your target architecture.

Programmers who are unfamiliar with VisualDSP++ or EZ-Board evaluation software should refer to the *ADSP-BF518F*, *ADSP-BF526*, or *ADSP-21469 EZ-Board Evaluation System Manual*, VisualDSP++ online Help, and user's or getting started guides. For locations of these documents, refer to "[Product Information](#)".

# 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 the first edition of the *Blackfin/SHARC USB EZ-Extender Manual*.

## 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](mailto:processor.tools.support@analog.com)
- E-mail processor questions to [processor.support@analog.com](mailto:processor.support@analog.com) (World wide support)  
[processor.europe@analog.com](mailto:processor.europe@analog.com) (Europe support)  
[processor.china@analog.com](mailto: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 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, VisualDSP++ online Help system, and a technical library CD.

- The Analog Devices Web site, [www.analog.com](http://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](http://www.analog.com/processors/technical_library).

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.

- Online documentation comprises the VisualDSP++ Help system, software tools manuals, hardware tools manuals, processor manuals, Dinkum Abridged C++ library, and FLEXnet License Tools software documentation. You can search easily across the entire VisualDSP++ documentation set for any topic of interest.
- The technical library CD contains seminar materials, product highlights, a selection guide, and documentation files of processor manuals, VisualDSP++ software manuals, and hardware tools manuals. To order the technical library CD, go to [http://www.analog.com/processors/technical\\_library](http://www.analog.com/processors/technical_library), navigate to the manuals page for your processor, click the request CD check mark, and fill out the order form.

## Notation Conventions

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

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 <b>Close</b> command appears on the <b>File</b> menu).
{this   that}	Alternative required items in syntax descriptions appear within curly brackets and separated by vertical bars; read the example as <i>this</i> or <i>that</i> . 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 <i>this</i> or <i>that</i> .
[this,...]	Optional item lists in syntax descriptions appear within brackets delimited by commas and terminated with an ellipsis; read the example as an optional comma-separated list of <i>this</i> .
.SECTION	Commands, directives, keywords, and feature names are in text with letter gothic font.
<i>filename</i>	Non-keyword placeholders appear in text with italic style format.
	<b>Note:</b> For correct operation, ... A Note provides supplementary information on a related topic. In the online version of this book, the word <b>Note</b> appears instead of this symbol.
	<b>Caution:</b> Incorrect device operation may result if ... <b>Caution:</b> 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 <b>Caution</b> appears instead of this symbol.
	<b>Warning:</b> 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 <b>Warning</b> appears instead of this symbol.

## Notation Conventions

# 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 1-2](#)
- [“USB 2.0 Interface” on page 1-3](#)



# 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 2-3](#).
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 USB Software Readme.txt file located in the `<install_path>\Blackfin\Examples\USB EZ-EXTENDER` or `<install_path>\214xx\Examples\USB EZ-EXTENDER VisualDSP++` 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 USB Software Readme.txt file located in the `<install_path>\Blackfin\Examples\USB EZ-EXTENDER` or

## USB 2.0 Interface

<install\_path>\214xx\Examples\USB EZ-EXTENDER VisualDSP++ directory. The readme file describes the USB software, source code, drivers, and explains how to run a USB-based application.

# **2    B L A C K F I N / S H A R C   U S B E Z - E X T E N D E R   H A R D W A R E R E F E R E N C E**

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 2-3](#)  
Describes the on-board configuration jumpers.

## System Architecture

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

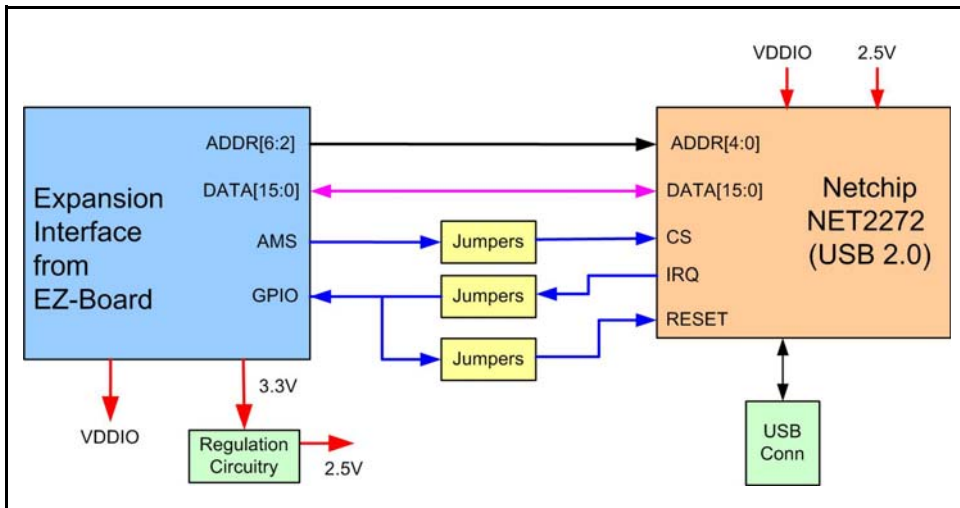


Figure 2-1. Block Diagram

## Jumper Settings

Before using the Blackfin/SHARC USB EZ-Extender, follow the setup procedure in [“Blackfin/SHARC USB EZ-Extender Setup”](#) on page 1-2.

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.

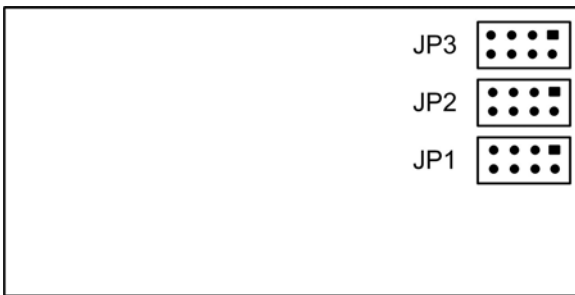


Figure 2-2. Jumper Locations

## **Jumper Settings**

### **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_SH ORT	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

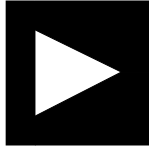
A

B

C

D

# BF/SHARC USB EZ-EXTENDER SCHEMATIC

		<b>ANALOG DEVICES</b>	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD
<b>Title</b>		BF/SHARC USB EZ-EXTENDER TITLE	
<b>Size</b> C	<b>Board No.</b>	A0224-2008	<b>Rev</b> 0.1
<b>Date</b>	1-7-2009_17:07	<b>Sheet</b>	1 of 3

A

B

C

D

1

1

2

2

3

3

4

4