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ADSP-CM403F EZ-KIT Lite®
Evaluation System Manual

Revision 1.0, September 2013

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ANALOG DEVICES

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Regulatory Compliance

The ADSP-CM403F EZ-KIT Lite 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 ADSP-CM403F EZ-KIT Lite is in the process of being certified to comply with the essential requirements of the European EMC directive 2004/108/EC and therefore carries the "**CE**" mark.

CE

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

USING ADSP-CM403F EZ-KIT LITE

ADSP-CM403F EZ-KIT LITE HARDWARE REFERENCE

PREFACE

Thank you for purchasing the ADSP-CM403F EZ-KIT Lite®, Analog Devices, Inc. low-cost evaluation system for the ADSP-CM403F mixed-signal control processor.

The ADSP-CM403F processor is based on the ARM® Cortex®-M4 processor core and is designed for photovoltaic applications. The EZ-KIT Lite is shipped with all of the necessary hardware—you can start the evaluation immediately. The package contains the standalone evaluation board and CE-approved power supply. The EZ-KIT Lite version ships with the J-Link Lite ARM, while the EZ-Board® version requires the customer to provide a debugger.

Two expansion connectors (analog interface and PWM/digital interface) are provided for connecting boards that incorporate motors. Another expansion connector is provided for connecting an Anybus board and/or a memory/FPGA extender card.

Traditional mechanical switches for changing the board's factory setup have been removed in favor of I^2C controlled software switches. The only remaining mechanical switches are the boot mode switch and push buttons.

The evaluation board is designed to be used in conjunction with the IAR Embedded Workbench development tools to test capabilities of the ADSP-CM403F processors. The development environment aids advanced application code development and debug, such as:

- Create, compile, assemble, and link application programs written in C++, C, and 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

Product Overview

The board features:

- Analog Devices ADSP-CM403F processor
    - 120-pin LQFP package
    - 30 MHz CLKIN core oscillator
- Universal Asynchronous Receiver/Transmitter (UART0)
    - Analog Devices ADM3252E RS-232 line transceiver
    - DB9 female connector
- Controller Area Network (CAN) interface
    - Analog Devices ADM3053 transceiver
    - RJ11 connector

- Display
    - New Haven NHD-0220D3Z-FL-GBW
    - 2 × 20 character
    - 2-wire interface (TWI) control
- RESET controller
    - Analog Devices ADM708 microprocessor supervisory circuits
- Debug (JTAG/SWD/SWV/TRACE) interface
    - JTAG/SWD 20-pin 0.1” header for use with IAR emulators
    - Trace/JTAG/SWD/SWV 20-pin 0.05” header
- LEDs
    - Six LEDs: one power (green), one board reset (red), one SYS_FAULT (red), and three general-purpose (amber)
- Push buttons
    - Three push buttons: one reset, two IRQ/Flag
- Asynchronous connector
    - 180-pin Samtec (QSH-090-01-F-D-A) 0.5 mm spacing
    - SMC0 address, data, and control
    - CLKOUT
    - SPI0
    - UART2
    - TWI0
    - GPIOs

    - RESET
    - GND/3.3V/5V output
- Pulse-width modulation (PWM) connector
    - 180-pin Samtec (QSH-090-01-F-D-A) 0.5 mm spacing
    - PWM0–PWM2
    - SINC0
    - SPI0
    - TWI0
    - TM0
    - CNT0–CNT1
    - SPORT1
    - GPIO
    - RESET
    - GND/3.3V/5V output
    - 5V input
- Analog connector interface
    - 120-pin Samtec (QSH-060-01-F-D-A) 0.5 mm spacing
    - ADC0–ADC1
    - DAC0–1
    - AGND/GND/VREF/5V output
    - ADR441 voltage reference (VREF)
    - ADA4899 buffer—0.1” header for reference

- External power supply
    - CE compliant
    - 5V @ 3.6 Amps
    - Ability to power from the PWM connector
- Other features
    - 0.05-ohm resistors for processor current measurement

For information about the hardware components of the EZ-KIT Lite, refer to ADSP-CM403F EZ-KIT Lite Bill Of Materials.

Purpose of This Manual

The *ADSP-CM403F EZ-KIT Lite Evaluation System Manual* provides instructions for installing the product hardware (board). The text describes operation and configuration of the board components and provides guidelines for running your own code on the ADSP-CM403F EZ-KIT Lite. Finally, a schematic and a bill of materials are provided for reference.

Intended Audience

The primary audience for this manual is a programmer who is familiar with an ARM Cortex-M4-based core.

The ADSP-CM40x family of mixed-signal control processors is based on the ARM Cortex-M4 processor core with floating-point unit and integrated SRAM memory, flash memory, accelerators, and peripherals.

The applicable documentation for programming the ARM Cortex-M4 processor core includes:

- *Cortex-M4 Devices Generic User Guide*
- *CoreSight ETM-M4 Technical Reference Manual*
- *Cortex-M4 Technical Reference Manual*

For additional information on this Analog Devices processor, see the *ADSP-CM40x Mixed-Signal Control Processor Hardware Reference*. This document describes the ARM Cortex-M4 processor core and memory architecture used on the ADSP-CM40x processor, but does not provide detailed programming information for the ARM core.

For more information about programming the ARM core, visit the ARM Information Center:

http://infocenter.arm.com/help/

Manual Contents

The manual consists of:

- Chapter 1, Using ADSP-CM403F EZ-KIT Lite
  Describes EZ-KIT Lite functionality from a programmer's perspective and provides a simplified memory map of the processor.
- Chapter 2, ADSP-CM403F EZ-KIT Lite Hardware Reference
  Provides information about the EZ-KIT Lite hardware components.
- Appendix A, ADSP-CM403F EZ-KIT Lite Bill Of Materials
  Lists the hardware components used to manufacture the EZ-KIT Lite.
- Appendix B, ADSP-CM403F EZ-KIT Lite Schematic
  Lists the resources for board-level debugging.

What's New in This Manual

This is the first edition (Revision 1.0) of the *ADSP-CM403F EZ-KIT Lite Evaluation System Manual*.

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 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 Processors

This evaluation system supports Analog Devices ADSP-CM403F processors.

Supported Tools

Information on supported tools for the ADSP-CM403F EZ-KIT Lite and the ADSP-CM40x family of mixed-signal control processors is available at:

http://www.analog.com/CM403FEZKit

Product Information

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

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.com 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.com provides access to books, application notes, data sheets, code examples, and more.

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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.

Notation Conventions

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

Example	Description
File > Close	Titles in reference sections indicate the location of an item within the CCES 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.

Example	Description
`.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-CM403F EZ-KIT LITE

This chapter provides information to assist you with development of programs for the ADSP-CM403F EZ-KIT Lite evaluation system.

The following topics are covered.

- Package Contents
- ADSP-CM403F EZ-Board
- Default Configuration
- IAR Embedded WorkBench and Board Installation
- IAR Embedded WorkBench Session Startup
- SPI Flash
- Analog Interface
- UART0 Interface (RS-232)
- CAN0 Interface
- Debug Interface
- Serial Liquid Crystal Display Module Interface
- Power-On-Self Test
- Expansion Interface
- Power Architecture

- Power Measurements
- Example Programs
- Reference Design Information

For detailed information on how to program the ADSP-CM403F processor, refer to the documents listed in the Preface.

Package Contents

Your ADSP-CM403F EZ-KIT Lite package contains the following items:

- ADSP-CM403F EZ-KIT Lite board
- Universal 5V DC power
- J-Link Lite ARM (only in the EZ-KIT Lite version)

Contact the vendor where you purchased your EZ-KIT Lite or contact Analog Devices, Inc. if any item is missing.

ADSP-CM403F EZ-Board

The ADSP-CM403F EZ-KIT Lite is shipped with the J-Link Lite ARM debugger. When the product is not shipped with the debugger, it is referred to as the ADSP-CM403F EZ-Board.

The EZ-Board requires a third party emulator.

Default Configuration

The ADSP-CM403F EZ-KIT Lite board is designed to run outside your personal computer as a standalone unit.

When removing the EZ-KIT Lite board from the package, handle the board carefully to avoid the discharge of static electricity, which can damage some components.

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.

Figure 1-1 shows the default jumper and boot mode switch settings used in installation. Confirm that your board is in the default configuration before using the board.

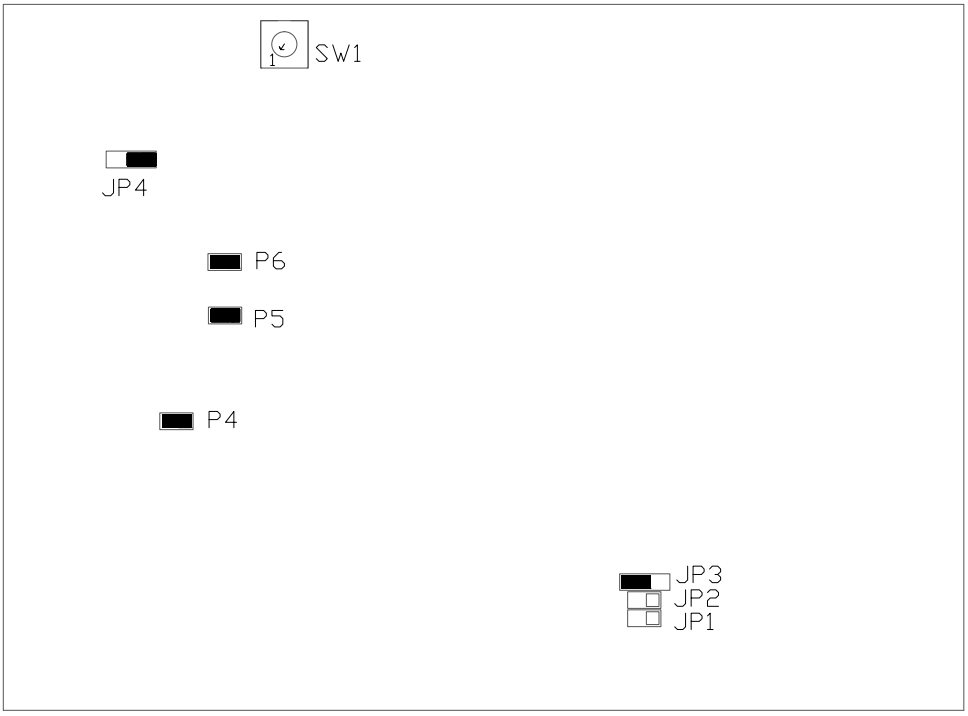

Figure 1-1. Default EZ-KIT Lite Hardware Setup

IAR Embedded WorkBench and Board Installation

For information about the IAR Embedded WorkBench® product and software download, go to:

http://www.iar.com/en/Products/IAR-Embedded-Workbench

The ADSP-CM403F EZ-KIT Lite software, based on the IAR Embedded WorkBench, can be found at:

http://www.analog.com/CM403FEZKit

Follow these instructions to ensure correct operation of the product software and hardware.

Step 1: Connect the EZ-KIT Lite board to a personal computer (PC) running **IAR Embedded WorkBench** using a J-Link/J-Trace emulator.

1. Plug one side of the USB cable into the USB connector of the emulator. Plug the other side into a USB port of the PC running **IAR Embedded WorkBench**.
2. Attach the emulator to the header connector, P1 or P2, on the EZ-KIT Lite board.

Step 2: Attach the provided cord and appropriate plug to the 5V power adaptor.

1. Plug the jack-end of the power adaptor into the power connector P7 (labeled 5V) on the EZ-KIT Lite board.
2. Plug the other side of the power adaptor into a power outlet. The power LED (labeled LED5) is lit green when power is applied to the board.