

***ADSP-CM419F EZ-KIT*® Manual**

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Regulatory Compliance

The *ADSP-CM419F EZ-KIT*® 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-CM419F EZ-KIT*® 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.



The *ADSP-CM419F EZ-KIT*[®] 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.



Contents

Preface

Purpose of This Manual.....	1-1
Intended Audience.....	1-1
Manual Contents.....	1-2
Technical Support.....	1-2
Supported Processors.....	1-3
Supported Tools.....	1-3
Product Information.....	1-3
Analog Devices Website.....	1-3
EngineerZone.....	1-4
Notation Conventions.....	1-4

Using the Board

Product Overview.....	2-1
Package Contents.....	2-3
Default Configuration.....	2-3
IAR Embedded WorkBench Setup.....	2-4
Debug Interface.....	2-6
Power-On-Self Test.....	2-6
Analog Input Channel Selection.....	2-6
Power Architecture.....	2-7
Power Measurements.....	2-7
Example Programs.....	2-7
Reference Design Information.....	2-7

32M-bit Serial Flash Memory with Dual and Quad SPI (W25Q32).....	2-8
USB to UART (FT232R).....	2-8
Signal and Power Isolated CAN Transceiver (ADM3053).....	2-9
Isolated Single Channel RS-232 Line Driver/Receiver (ADM3251E)	2-10
Isolated, Dual Channel RS-232 Line Driver/Receiver (ADM3252E)	2-10
Unity-Gain Stable, Ultralow Distortion, 1 nV/ $\sqrt{\text{Hz}}$ Voltage Noise, High Speed Op Amp (ADA4899)	2-11
Ultralow Noise, LDO XFET Voltage References with Current Sink and Source (ADR441B)	2-11
36 V Precision, 2.8 nV/ $\sqrt{\text{Hz}}$ Rail-to-Rail Output Op Amp (AD8675)	2-12
Ultraprecision, 36 V, 2.8 nV/ $\sqrt{\text{Hz}}$ Dual Rail-to-Rail Output Op Amp (AD8676).....	2-12
1 ppm 20-Bit, ± 1 LSB INL, Voltage Output DAC (AD5791)	2-13
Isolated, 5 kV, DC-to-DC Converter (ADUM6000).....	2-13
Isolated Sigma-Delta Modulator (AD7401)	2-13
4K I ² C Serial EEPROM (24AA04).....	2-14
2.2 TFT LCD	2-14

Hardware Reference

System Architecture	3-1
Switches.....	3-2
Reset Pushbutton (SW6).....	3-2
GPIO Pushbuttons (SW1-5).....	3-3
Pushbutton Enable (SW7)	3-3
SPI Flash Enable (SW8).....	3-3
LED Enable (SW9)	3-4
Jumpers	3-4
Boot Mode Select (JP1).....	3-5
VDD_INT Regulator Select (JP2)	3-6
CAN Interface (JP4 and JP5)	3-6

UART Interface (JP6 and JP7)	3-6
VREF Source (JP8 - JP10)	3-7
ADC VIN0 A0 (JP11 - JP14)	3-7
AIN DUT (JP15 - JP37).....	3-8
DC Bias Source (JP38 and JP39)	3-8
SINC Interface (JP40)	3-8
Main Power Select (JP44)	3-8
DC Bias Select (P5)	3-9
Isolated Power (P15)	3-9
Single Ended Input (P16).....	3-9
AD7401 Power (P17).....	3-9
Current Measurement (P20 and P21).....	3-9
LEDs	3-10
Power (LED1)	3-10
GPIO (LED2-3)	3-11
Reset (LED4).....	3-11
Fault (LED5).....	3-11
Connectors	3-11
Clock (J1 and J2)	3-12
Analog Interface (J3).....	3-13
PWM Interface (J4).....	3-13
DAC0 VOUT (J5).....	3-13
CAN (J6 and J7)	3-13
UART (J8 and J9)	3-14
ADC Input (J10-J13, J15 and J16).....	3-14
DC Bias (J17).....	3-14
Sense (J18).....	3-14
LCD (J19 and J20)	3-15
Character Display (J21).....	3-15

Debug (P1 and P2).....3-15
USB (P3).....3-15
AFE Supply (P6 - P9, P11 and P12).....3-15
Power (P19).....3-16

1 Preface

Thank you for purchasing the Analog Devices, Inc. *ADSP-CM419F EZ-KIT*® evaluation system.

The ADSP-CM419F processor is based on the ARM® Cortex®-M4 processor core with floatingpoint unit operating at frequencies up to 240 MHz, and the ARM® Cortex-M0™ processor core operating at frequencies up to 100 MHz. The processors integrate up to 160K Bytes of SRAM memory with ECC, up to 1M Byte of flash memory with ECC, accelerators and peripherals optimized for motor control and photo-voltaic (PV) inverter control, and an analog front end consisting of up to two 6 times simultaneous sampling 16-bit SAR-type ADCs, one 14-bit SAR monitor ADC and one 12-bit DAC. The EZ-KIT ships with all of the necessary hardware to get you up and running and start the evaluation immediately.

The EZ-KIT contains an analog interface and PWM/digital interface. These interfaces are provided for connecting with daughter boards to expand on the functionality of the EZ-KIT.

The evaluation board is designed to be used in conjunction with the IAR Embedded Workbench® and Segger® development environment for 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

Purpose of This Manual

This manual provides instructions for installing the product hardware (board). The text describes operation and configuration of the board components and provides guidelines for running code on the board.

Intended Audience

The primary audience for this manual is a programmer who is familiar with an ARM Cortex-M4 core. The ADSP-CM41x family of mixed-signal control processors is based on the ARM Cortex-M4 core.

For additional information about the Analog Devices processor, see the *Hardware Reference Manual*. The document describes the core and memory architecture of the ADSP-CM41x processor, but does not provide detailed programming information for the ARM core.

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

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

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

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

Manual Contents

The manual consists of:

- *Using the board*

Provides basic board information.

- *Hardware Reference*

Provides information about the hardware aspects of the board.

- *Bill of Materials*

A companion file in PDF format that lists all of the components used on the board is available in the installation directory for the Board Support Package (BSP) and on <http://www.analog.com/ADSPCM419FEZKIT>.

- *Schematic*

A companion file in PDF format documenting all of the circuits used on the board is available in the installation directory for the Board Support Package (BSP) and on <http://www.analog.com/ADSPCM419FEZKIT>.

Technical Support

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

- 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++*[®]:

If using 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.tools.support@analog.com

processor.china@analog.com

- Contact your Analog Devices sales office or authorized distributor. Locate one at:

<http://www.analog.com/adi-sales>

- Send questions by mail to:

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USA

Supported Processors

This evaluation system supports the Analog Devices ADSP-CM419F processor.

Supported Tools

Information about code development tools for the *ADSP-CM419F EZ-KIT*[®] and ADSP-CM41x family of processors is available at:

<http://www.analog.com/ADSPCM419FEZKIT>

Product Information

Product information can be obtained from the Analog Devices Website

Analog Devices Website

The Analog Devices website, <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. 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 website 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.

Visit MyAnalog.com 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, Inc. 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.

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.

<i>Example</i>	<i>Description</i>
File > Close	Titles in bold style indicate the location of an item within the CrossCore Embedded Studio IDE's menu system (for example, the <i>Close</i> command appears on the <i>File</i> 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 letter gothic font and italic style format.
NOTE:	<i>NOTE:</i> For correct operation, .. A note provides supplementary information on a related topic. In the online version of this book, the word <i>NOTE:</i> appears instead of this symbol.

<i>Example</i>	<i>Description</i>
CAUTION:	<p><i>CAUTION:</i> Incorrect device operation may result if ..</p> <p><i>CAUTION:</i> Device damage may result if ..</p> <p>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 <i>CAUTION:</i> appears instead of this symbol.</p>
ATTENTION:	<p><i>ATTENTION:</i> Injury to device users may result if ..</p> <p>A warning identifies conditions or inappropriate usage of the product that could lead to conditions that are potentially hazardous for devices users. In the online version of this book, the word <i>ATTENTION:</i> appears instead of this symbol.</p>

2 Using the Board

This chapter provides information on the major components and peripherals on the board along with instructions for installing and setting up the emulation software.

Product Overview

The board features:

- Analog Devices ADSP-CM419F processor
 - 210 ball BGA
 - 16 and 30 MHz oscillators
- Analog Interface
 - Analog Devices [Unity-Gain Stable, Ultralow Distortion, 1 nV/√Hz Voltage Noise, High Speed Op Amp \(ADA4899\)](#)
 - Analog Devices [Ultralow Noise, LDO XFET Voltage References with Current Sink and Source \(ADR441B\)](#)
 - Analog Devices [1 ppm 20-Bit, ±1 LSB INL, Voltage Output DAC \(AD5791\)](#)
- LCD
 - 2.2 inch TFT LCD module
- SPI Flash (SPI0) chip
 - Microchip [4K I²C Serial EEPROM \(24AA04\)](#)
- Universal Asynchronous Receiver/Transmitter (UART0)
 - Analog Devices [Isolated Single Channel RS-232 Line Driver/Receiver \(ADM3251E\)](#)
 - DB9
- Universal Asynchronous Receiver/Transmitter (UART3)
 - FTDI [USB to UART \(FT232R\)](#)

- USB mini-B
- Universal Asynchronous Receiver/Transmitter (UART4)
 - Analog Devices [Isolated, Dual Channel RS-232 Line Driver/Receiver \(ADM3252E\)](#)
 - DB9
- CAN
 - Analog Devices [Signal and Power Isolated CAN Transceiver \(ADM3053\)](#)
 - RJ11
- SINC
 - Analog Devices [Isolated, 5 kV, DC-to-DC Converter \(ADUM6000\)](#)
 - Analog Devices [Isolated Sigma-Delta Modulator \(AD7401\)](#)
- Debug (JTAG/SWD/SWO) interface
 - J-Link Lite emulator
 - JTAG/SWD/SWO 20-pin 0.1" header
 - JTAG/SWD/SWO 20-pin 0.05" header
- LEDs
 - Five LEDs: one power (green), one board reset (red), two general-purpose (amber) and one fault (red)
- Pushbuttons
 - Six pushbuttons: one reset and five IRQ/Flag
- Analog connector
 - ADC
 - AGND/GND/VREF/5V
- PWM connector
 - PWM0-2
 - SINC0
 - SPI1
 - SPORT0
 - TWI0
 - TMR0
 - GPIOs

- CNT0-3
- RESET
- GND/3.3V/5V output
- External power supply
 - CE compliant
 - 5V @3.6 Amps
- Power measurement
 - 0.051-ohm resistors for measuring current draw

Package Contents

Your *ADSP-CM419F EZ-KIT*® package contains the following items.

- *ADSP-CM419F EZ-KIT*® board
- Universal 5V DC power supply
- USB 2.0 type A to mini-B cable
- J-Link Lite emulator

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

Default Configuration

The *ADSP-CM419F EZ-KIT*® board is designed to run as a standalone unit.

The *Default Hardware Setup* figure shows the default settings for jumpers and switches and the location of the jumpers, switches, connectors, and LEDs. Confirm that your board is in the default configuration before using the board.

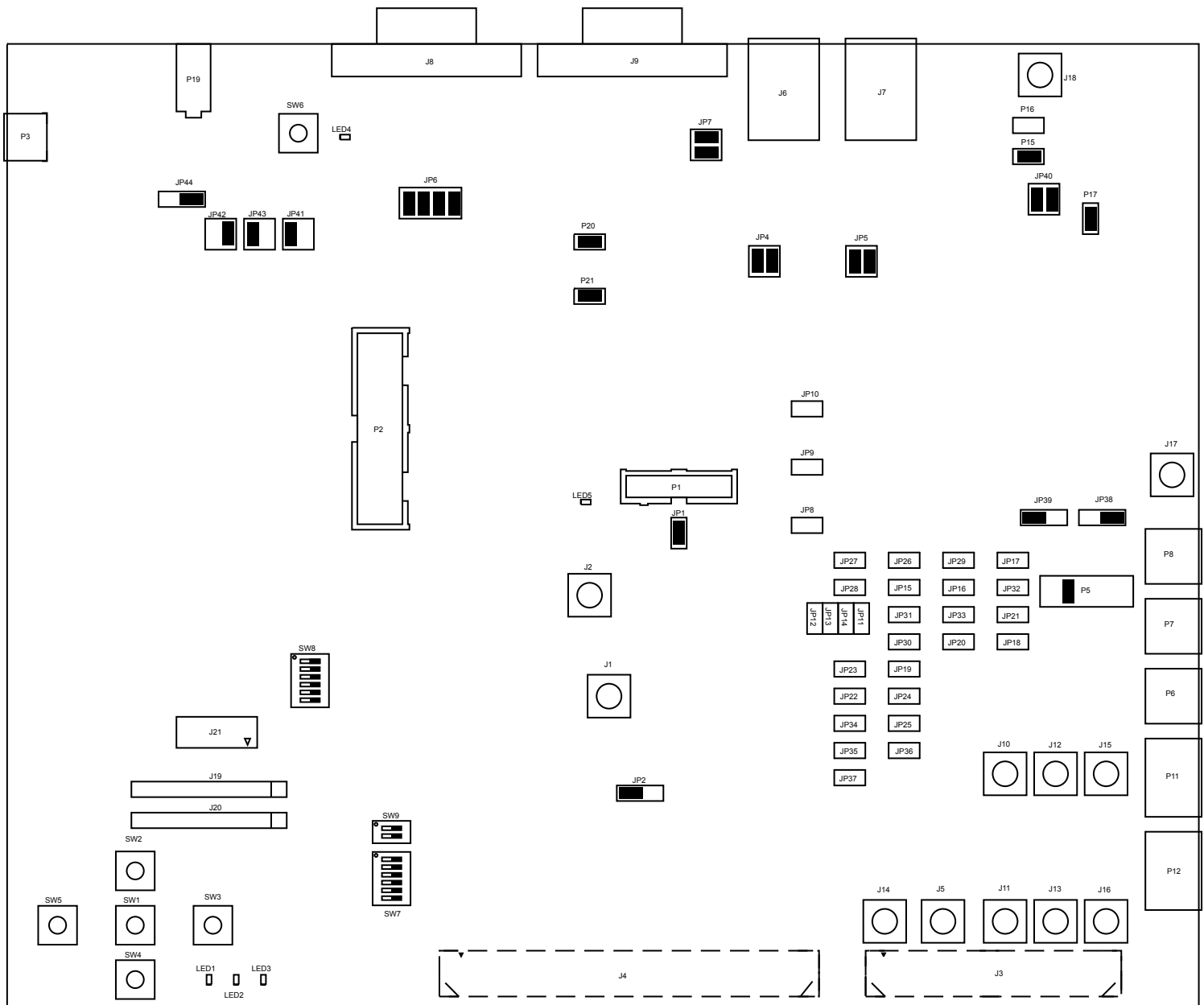


Figure 2-1: Default Hardware Setup

IAR Embedded WorkBench Setup

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

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

The *ADSP-CM419F EZ-KIT*® software, based on the IAR Embedded WorkBench, can be found at:

<http://www.analog.com/ADSPCM419FEZKIT>

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

1. Connect the EZ-KIT board to a personal computer (PC) running *IAR Embedded WorkBench*, using a J-Link/J-Trace emulator:
 - a. 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*.
 - b. Attach the emulator to the header connector, P1 or P2 , on the EZ-KIT board.
2. Attach the provided cord and appropriate plug to the 5V power adapter:
 - a. Plug the jack-end of the power adapter into the power connector P19 on the EZ-KIT board.
 - b. Plug the other side of the power adapter into a power outlet. The power LED (LED1) is lit green when power is applied to the board.

It is assumed that the IAR Embedded WorkBench software is installed and running on your PC.

1. Navigate to the *IAR Embedded WorkBench* environment via the *Start* menu.
2. Choose *File > Open > Workspace* to open a workspace for the project to download and debug.
3. Choose *Project > Options*.

The *General Options, Target* page appears.

4. In *Processor variant*, ensure *Device* is *Analog Devices CM41x*
5. Choose *Debugger* in the *Category* pane.

The *Debugger, Setup* options page appears.

- a. In *Driver*, choose *J-Link/J-Trace* as the emulator to be used to debug the target board.
 - b. Click the *Download* tab. The *Debugger, Download* options page appears.
 - c. Ensure *Use flash loader(s)* is enabled. Note that other download settings are optional.
6. Choose *Debugger > J-Link/J-Trace* in the *Category* pane.

The emulator *Setup* options page appears.

- a. On the *Setup* page,
 - In *Reset*, select *Connect during reset* from the drop-down list.
 - In *JTAG/SWD speed*, select *Auto*.
 - (Optional) In *Clock setup*, change the default values.
 - b. On the *Connection* page,
 - In *Communication*, select *USB* and *Device 0*.
 - In *Interface*, select *SWD*.
7. Click *OK* to save the emulator settings.

8. Choose *Project > Debug and Download* to download the project and start debugging.

Debug Interface

The EZ-KIT provides a JTAG/SWD/SWO connection via .

Power-On-Self Test

The Power-On-Self-Test Program (POST) tests all EZ-KIT peripherals and validates functionality as well as connectivity to the processor. Once assembled, each EZ-KIT is fully tested for an extended period of time with POST. All EZ-KITs boards are shipped with POST preloaded into flash memory. The POST is executed by resetting the board and pressing the proper push button(s). The POST also can be used as a reference for a custom software design or hardware troubleshooting.

Note that the source code for the POST program is included in the Board Support Package (BSP) along with the `readme.txt` file that describes how the board is configured to run POST.

Analog Input Channel Selection

The *ADSP-CM419F EZ-KIT*[®] has 24 Primary ADC Input Channels & 7 Secondary ADC Input Channels as follows:

- Primary
 - A0 - A7
 - B0 - B7
 - C0 - C7
- Secondary
 - D0 - D7

Multiple input options are available for the ADC Inputs. These include:

- Expansion Interface
- On-board precision DAC
- Op-amp based conditionint of signals via SMC connector

There are 6 SMC connectors on board (J10, J11, J12, J13, J15, J16) that connects to the signal conditioning circuits (DUTs). Each Input can select between two such DUTs.

The inputs can also select between expansion interface or the DAC output. Note that DAC output is not available on all channels. By default, all inputs (except A0) are connected to the expansion interface via resistors that need to be installed. The input channel A0 is provided with jumpers on all four selections.

Power Architecture

Digital Supply

The *ADSP-CM419F EZ-KIT*[®] has two primary voltage domains: 3.3V and 1.2V. The main input is a 5V wall adaptor. The 5V source can be selected via JP44 to input from the PWM connector (J4) as an alternative to the wall power adaptor. Refer to J4 and JP44 for details. The Analog Devices ADM7172 LDO provides 3.3V for the VDD_EXT signal and the 3.3V power requirements of the board. The VDD_INT signal is delivered through either Analog Devices regulator ADP1715 Linear Regulator (VR2) or a PNP transistor (Q1). Jumper JP2 is provided to select between External and Internal regulator.

Analog Front End

The Analog Front End is powered via VDD_ANA0 and VDD_ANA1 power pins which fall in 3.3V domain. The Fast Over Current Protection (FOCP) Comparators are powered via VDD_COMP. By default, analog supplies are powered from the ADM7172 LDO which powers up the VDD_EXT and rest of the 3.3V domain. External supplies can power up the analog domain via P6, P7 & P8. A +/-5V supply (via P11) is required for the Op Amps at the input of the Analog Input Channels. A +/-15V supply is required for the DAC AD5791.

Power Measurements

Locations are provided for measuring the current draw from various power planes. Precision 0.051 ohm shunt resistors are available on the 3.3V and VDD_EXT voltage domains. For current draw, the jumper is removed, voltage across the resistor can be measured using an oscilloscope, and the value of the resistor can be measured using a precision multi-meter. Once voltage and resistance are measured, the current can be calculated by dividing the voltage by the resistance. For the highest accuracy, a differential probe should be used for measuring the voltage across the resistor.

Example Programs

Example programs are provided with the *ADSP-CM419F EZ-KIT*[®] Board Support Package (BSP) to demonstrate various capabilities of the product. The programs can be found in the *ADSP-CM419F_EZ-KIT\examples* installation folder. Refer to a readme file provided with each example for more information.

Reference Design Information

A reference design info package is available for download on the Analog Devices Web site. The package provides information on the schematic design, layout, fabrication, and assembly of the board.

The information can be found at:

<http://www.analog.com/ADSPCM419FEZKIT> .

32M-bit Serial Flash Memory with Dual and Quad SPI (W25Q32)

The W25Q32BV (32 Mb) Serial Flash memory provides a storage solution for systems with limited space, pins and power. The 25Q series offers flexibility and performance well beyond ordinary Serial Flash devices. They are ideal for code shadowing to RAM, executing code directly from Dual/Quad SPI (XIP) and storing voice, text and data. The device operates on a single 2.7V to 3.6V power supply with current consumption as low as 4 mA active and 1 uA for power-down.

The W25Q32BV array is organized into 16,384 programmable pages of 256 bytes each. Up to 256 bytes can be programmed at a time. Pages can be erased in a group of 16 (4 KB sector erase), groups of 128 (32 KB block erase), groups of 256 (64 KB block erase) or the entire chip (chip erase). The W25Q32BV has 1024 erasable sectors and 64 erase blocks respectively. The small 4 KB sectors allow for greater flexibility in applications that require data and parameter storage.

The W25Q32BV supports the standard Serial Peripheral Interface (SPI), and a high performance Dual/Quad output as well as Dual/Quad I/O SPI: Serial Clock, Chip Select, Serial Data I/O0 (DI), I/O1 (DO), I/O2 (WP), and I/O3 (/HOLD). SPI clock frequencies of up to 104 MHz are supported, providing equivalent clock rates of 208 MHz (104 MHz x 2) for Dual I/O and 320 MHz (80 MHz x 4) for Quad I/O when using Fast Read Dual/Quad I/O instructions. These transfer rates can outperform standard Asynchronous 8 and 16-bit Parallel Flash memories. The Continuous Read Mode allows for efficient memory access with as few as 8-clocks of instruction-overhead to read a 24-bit address, allowing true XIP (execute in place) operation.

USB to UART (FT232R)

The FT232R is a USB-to-serial-UART interface with the following advanced features:

- Single chip USB to asynchronous serial data transfer interface
- Entire USB protocol handled on the chip. No USB specific firmware programming required
- Fully-integrated 1024 bit EEPROM storing device descriptors and CBUS I/O configuration
- Fully-integrated USB termination resistors
- Fully-integrated clock generation with no external crystal required, plus optional clock output selection enabling a glue-less interface to external MCU or FPGA
- Data transfer rates from 300 baud to 3 Mbaud (RS422, RS485, RS232) at TTL levels
- 128 byte receive buffer and 256 byte transmit buffer utilising buffer smoothing technology to allow for high-data throughput
- FTDI's royalty-free Virtual Com Port (VCP) and Direct (D2XX) drivers eliminate the requirement for USB driver development in most cases.
- Transmit and receive LED drive signals

- UART interface support for 7 or 8 data bits, 1 or 2 stop bits and odd / even / mark / space / no parity
- FIFO receives and transmits buffers for high-data throughput
- Device supplied pre-programmed with unique USB serial number
- Supports bus powered, self-powered and high-power bus powered USB configurations
- Integrated +3.3V level converter for USB I/O
- Integrated level converter on UART and CBUS for interfacing to between +1.8V and +5V logic
- True 5V/3.3V/2.8V/1.8V CMOS drive output and TTL input
- Configurable I/O pin output drive strength
- Integrated power-on-reset circuit
- Fully-integrated AVCC supply filtering - no external filtering required.
- UART signal inversion option
- +3.3V (using external oscillator) to +5.25V (internal oscillator) single supply operation
- Low-operating and USB suspend current
- Low USB bandwidth consumption
- UHCI/OHCI/EHCI host controller compatible
- USB 2.0 full speed compatible

Signal and Power Isolated CAN Transceiver (ADM3053)

The ADM3053 is an isolated controller area network (CAN) physical layer transceiver with an integrated isolated dc-to-dc converter. The ADM3053 complies with the ISO 11898 standard.

The device employs Analog Devices, Inc., iCoupler® technology to combine a 2-channel isolator, a CAN transceiver, and Analog Devices isoPower® dc-to-dc converter into a single SOIC surface mount package. An on-chip oscillator outputs a pair of square waveforms that drive an internal transformer to provide isolated power. The device is powered by a single 5 V supply realizing a fully isolated CAN solution.

The ADM3053 creates a fully isolated interface between the CAN protocol controller and the physical layer bus. It is capable of running at data rates of up to 1 Mbps.

The device has current limiting and thermal shutdown features to protect against output short circuits. The part is fully specified over the industrial temperature range and is available in a 20-lead, wide-body SOIC package.

The ADM3053 contains isoPower technology that uses high frequency switching elements to transfer power through the transformer. Special care must be taken during printed circuit board (PCB) layout to meet emissions standards. Refer to the AN-0971 Application Note, Control of Radiated Emissions with isoPower Devices, for details on board layout considerations.

Isolated Single Channel RS-232 Line Driver/Receiver (ADM3251E)

The ADM3251E1 is a high speed, 2.5 kV fully isolated, single-channel RS-232/V.28 transceiver device that operates from a single 5 V power supply. Due to the high ESD protection on the RIN and TOUT pins, the device is ideally suited for operation in electrically harsh environments or where RS-232 cables are frequently being plugged and unplugged.

The ADM3251E incorporates dual-channel digital isolators with isoPower™ integrated, isolated power. There is no requirement to use a separate isolated dc-to-dc converter. Chip-scale transformer iCoupler® technology from Analog Devices, Inc., is used both for the isolation of the logic signals as well as for the integrated dc-to-dc converter. The result is a total isolation solution.

The ADM3251E contains isoPower technology that uses high frequency switching elements to transfer power through the transformer. Special care must be taken during printed circuit board (PCB) layout to meet emissions standards. Refer to Application Note AN-0971, Control of Radiated Emissions with isoPower Devices, for details on board layout considerations.

The ADM3251E conforms to the EIA/TIA-232E and ITU-T V. 28 specifications and operates at data rates up to 460 kbps.

Four external 0.1 μ F charge pump capacitors are used for the voltage doubler/inverter, permitting operation from a single 5 V supply.

The ADM3251E is available in a 20-lead, wide body SOIC package and is specified over the -40°C to $+85^{\circ}\text{C}$ temperature range.

Isolated, Dual Channel RS-232 Line Driver/Receiver (ADM3252E)

The ADM3252E is a high speed, 2.5 kV, fully isolated, dual-channel RS-232/V.28 transceiver device that is operational from a single 3.3 V or 5 V power supply. Because of high ESD protection on the RIN1, RIN2, TOUT1, and TOUT2 pins, the ADM3252E is ideally suited for operation in electrically harsh environments or where RS-232 cables are frequently plugged and unplugged.

The ADM3252E provides four independent isolation channels using the integrated and isolated power of isoPower™. There is no requirement to use a separate isolated dc-to-dc converter. Chip scale transformer iCoupler® technology from Analog Devices, Inc., is used for both the isolation of the logic signals and the integrated dc-to-dc converter. The result is a total isolation solution.

isoPower technology in the ADM3252E uses high frequency switching elements to transfer power through its transformer. Special care must be taken during printed circuit board (PCB) layout to meet emissions standards. Refer to the AN-0971 Application Note, Recommendations for Control of Radiated Emissions with isoPower Devices, for details on board layout considerations.

The ADM3252E conforms to the EIA/TIA-232E and ITU-T V.28 specifications and operates at data rates of up to 460 kbps. Four external 0.1 μF charge pump capacitors are used for the voltage doubler/inverter, permitting operation from a single 3.3 V or 5 V supply. The ADM3252E is available in a 44-ball, chip scale package ball grid array (CSP_BGA) and is specified over the -40°C to $+85^{\circ}\text{C}$ temperature range.

Unity-Gain Stable, Ultralow Distortion, 1 nV/ $\sqrt{\text{Hz}}$ Voltage Noise, High Speed Op Amp (ADA4899)

The ADA4899-1 is an ultralow noise (1 nV/ $\sqrt{\text{Hz}}$) and distortion (<-117 dBc @1 MHz) unity-gain stable voltage feedback op amp, the combination of which makes it ideal for 16-bit and 18-bit systems. The ADA4899-1 features a linear, low noise input stage and internal compensation that achieves high slew rates and low noise even at unity gain. The Analog Devices, Inc. proprietary next-generation XFCB process and innovative circuit design enable such high performance amplifiers.

The ADA4899-1 drives 100 Ω loads at breakthrough performance levels with only 15 mA of supply current. With the wide supply voltage range (4.5 V to 12 V), low offset voltage (230 μV maximum), wide bandwidth (600 MHz), and slew rate (310 V/ μs), the ADA4899-1 is designed to work in the most demanding applications. The ADA4899-1 also features an input bias current cancellation mode that reduces input bias current by a factor of 60.

The ADA4899-1 is available in a 3 mm \times 3 mm LFCSP and an 8-lead SOIC package. Both packages feature an exposed metal paddle that improves heat transfer to the ground plane, which is a significant improvement over traditional plastic packages. The ADA4899-1 is rated to work over the extended industrial temperature range, -40°C to $+125^{\circ}\text{C}$.

Ultralow Noise, LDO XFET Voltage References with Current Sink and Source (ADR441B)

The ADR44x series is a family of XFET[®] voltage references featuring ultralow noise, high accuracy, and low temperature drift performance. Using Analog Devices, Inc., patented temperature drift curvature correction and XFET (eXtra implanted junction FET) technology, voltage change vs. temperature nonlinearity in the ADR44x is greatly minimized.

The XFET references offer better noise performance than buried Zener references, and XFET references operate off low supply voltage headroom (0.5 V). This combination of features makes the ADR44x family ideally suited for precision signal conversion applications in high-end data acquisition systems, optical networks, and medical applications.

The ADR44x family has the capability to source up to 10 mA of output current and sink up to -5 mA. It also comes with a trim terminal to adjust the output voltage over a 0.5% range without compromising performance.

Offered in two electrical grades, the ADR44x family is available in 8-lead MSOP and narrow SOIC packages. All versions are specified over the extended industrial temperature range of -40°C to $+125^{\circ}\text{C}$.

36 V Precision, 2.8 nV/ $\sqrt{\text{Hz}}$ Rail-to-Rail Output Op Amp (AD8675)

The AD8675 precision operational amplifier has ultralow offset, drift, and voltage noise combined with very low input bias currents over the full operating temperature range. The AD8675 is a precision, wide bandwidth op amp featuring rail-to-rail output swings and very low noise. Operation is fully specified from ± 5 V to ± 15 V.

The AD8675 features a rail-to-rail output like that of the OP184, but with wide bandwidth and even lower voltage noise, combined with the precision and low power consumption like that of the industry-standard OP07 amplifier. Unlike other low noise, rail-to-rail op amps, the AD8675 has very low input bias current and low input current noise.

With typical offset voltage of only 10 μV , offset drift of 0.2 $\mu\text{V}/^\circ\text{C}$, and noise of only 0.10 μV p-p (0.1 Hz to 10 Hz), the AD8675 is perfectly suited for applications where large error sources cannot be tolerated. For applications with even lower offset tolerances, the proprietary nulling capability allows a combination of both device and system offset errors up to 3.5 mV (referred to the input) to be compensated externally. Unlike previous circuits, the AD8675 accommodates this adjustment without adversely affecting the offset drift, CMRR, and PSRR of the amplifier. Precision instrumentation, PLL, and other precision filter circuits, position and pressure sensors, medical instrumentation, and strain gage amplifiers benefit greatly from the very low noise, low input bias current, and wide bandwidth. Many systems can take advantage of the low noise, dc precision, and rail-to-rail output swing provided by the AD8675 to maximize SNR and dynamic range.

The smaller packages and low power consumption afforded by the AD8675 allow maximum channel density or minimum board size for space-critical equipment.

The AD8675 is specified for the extended industrial temperature range (-40°C to $+125^\circ\text{C}$). The AD8675 amplifier is available in the tiny 8-lead MSOP, and the popular 8-lead, narrow SOIC, RoHS compliant packages. MSOP packaged devices are only available in tape and reel format.

Ultraprecision, 36 V, 2.8 nV/ $\sqrt{\text{Hz}}$ Dual Rail-to-Rail Output Op Amp (AD8676)

The AD8676 precision operational amplifier offers ultralow offset, drift, and voltage noise combined with very low input bias currents over the full operating temperature range. The AD8676 is a precision, wide bandwidth op amp featuring rail-to-rail output swings and very low noise. Operation is fully specified from ± 5 V to ± 15 V.

The AD8676 features a rail-to-rail output like that of the OP184, but with wide bandwidth and even lower voltage noise, combined with the precision and low power consumption like that of the industry-standard OP07 amplifier. Unlike other low noise, rail-to-rail op amps, the AD8676 has very low input bias current and low input current noise.

With typical offset voltage of only 12 μV , offset drift of 0.2 $\mu\text{V}/^\circ\text{C}$, and noise of only 0.10 μV p-p (0.1 Hz to 10 Hz), the AD8676 is perfectly suited for applications where large error sources cannot be tolerated. Precision instrumentation, PLL and other precision filter circuits, position and pressure sensors, medical instrumentation, and strain

gage amplifiers benefit greatly from the very low noise, low input bias current, and wide bandwidth. Many systems can take advantage of the low noise, dc precision, and rail-to-rail output swing provided by the AD8676 to maximize SNR and dynamic range.

The smaller packages and low power consumption afforded by the AD8676 allow maximum channel density or minimum board size for space-critical equipment.

The AD8676 is specified for the extended industrial temperature range (-40°C to $+125^{\circ}\text{C}$). The AD8676 is available in the 8-lead MSOP, and the popular 8-lead, narrow SOIC; both of which are lead-free packages. MSOP packaged devices are only available in tape and reel format.

1 ppm 20-Bit, ± 1 LSB INL, Voltage Output DAC (AD5791)

The AD5791 is a single 20-bit, unbuffered voltage-output DAC that operates from a bipolar supply of up to 33 V. The AD5791 accepts a positive reference input in the range 5 V to $V_{DD} - 2.5$ V and a negative reference input in the range $V_{SS} + 2.5$ V to 0 V. The AD5791 offers a relative accuracy specification of ± 1 LSB max, and operation is guaranteed monotonic with a ± 1 LSB DNL maximum specification.

The part uses a versatile 3-wire serial interface that operates at clock rates up to 35 MHz and that is compatible with standard SPI, QSPI™, MICROWIRE™, and DSP interface standards. The part incorporates a power-on reset circuit that ensures the DAC output powers up to 0 V and in a known output impedance state and remains in this state until a valid write to the device takes place. The part provides an output clamp feature that places the output in a defined load state.

Isolated, 5 kV, DC-to-DC Converter (ADUM6000)

The ADuM6000 is an isolated dc-to-dc converter based on the Analog Devices, Inc., iCoupler® technology. The dc-to-dc converter in this device provides regulated, isolated power in several combinations of input and output voltages.

The Analog Devices chip scale transformer iCoupler technology transfers isolated power in this dc-to-dc converter with up to 31% efficiency. The result is a small form factor, total isolation solution.

Higher output power levels are obtained by using the ADuM6000 to augment the power output of the ADuM5401, ADuM5402, ADuM5403, ADuM5404, ADuM520x, and ADuM620x iCouplers with isoPower®.

isoPower uses high frequency switching elements to transfer power through its transformer. Special care must be taken during printed circuit board (PCB) layout to meet emissions standards. See the AN-0971 Application Note for board layout recommendations.

Isolated Sigma-Delta Modulator (AD7401)

The AD7401 is a second-order, sigma-delta (Σ - Δ) modulator that converts an analog input signal into a high speed, 1-bit data stream with on-chip digital isolation based on Analog Devices, Inc., iCoupler® technology. The

AD7401 operates from a 5 V power supply and accepts a differential input signal of ± 200 mV (± 320 mV full scale). The analog input is continuously sampled by the analog modulator, eliminating the need for external sample- and-hold circuitry. The input information is contained in the output stream as a density of ones with a data rate up to 20 MHz. The original information can be reconstructed with an appropriate digital filter. The serial input/output can use a 5 V or a 3 V supply (VDD2).

The serial interface is digitally isolated. High speed CMOS, combined with monolithic air core transformer technology, means the on-chip isolation provides outstanding performance characteristics, superior to alternatives such as optocoupler devices. The device contains an on-chip reference. The AD7401 is offered in a 16-lead SOIC and has an operating temperature range of -40°C to $+105^{\circ}\text{C}$.

4K I²C Serial EEPROM (24AA04)

The Microchip Technology Inc. 24AA04/24LC04B (24XX04*) is a 4 Kbit Electrically Erasable PROM. The device is organized as two blocks of 256 x 8-bit memory with a 2-wire serial interface. Low-voltage design permits operation down to 1.7V, with standby and active currents of only 1 μA and 1 mA, respectively. The 24XX04 also has a page write capability for up to 16 bytes of data.

2.2 TFT LCD

This 2.2-inch TFT LCD module features a SPI interface fully compatible with popular LCD5110 interface.

Features

- TFT01_2.2 SP is a 2.2 "SPI TFT LCD Screen Module, 10pins interface, compatible LCD5110 interface. Not just a LCD but also includes an SD card connector.
- The LCD in the TFT01 is ILI9341. It's a 240 * 320 (resolution), 2.2S inch TFT LCD screen. The LCD has a wide viewing angle, the contrast is also very suitable.
- The display interface is serial, it just needs 5 wires (CS, RS, SCL, SDA, RST) for controlling.
- SDcard use hardware SPI interface (CS / MOSI / MISO / SCK).

3 Hardware Reference

This chapter describes the hardware design of the *ADSP-CM419F EZ-KIT*®.

System Architecture

The board's configuration is shown in the *Block Diagram* figure.

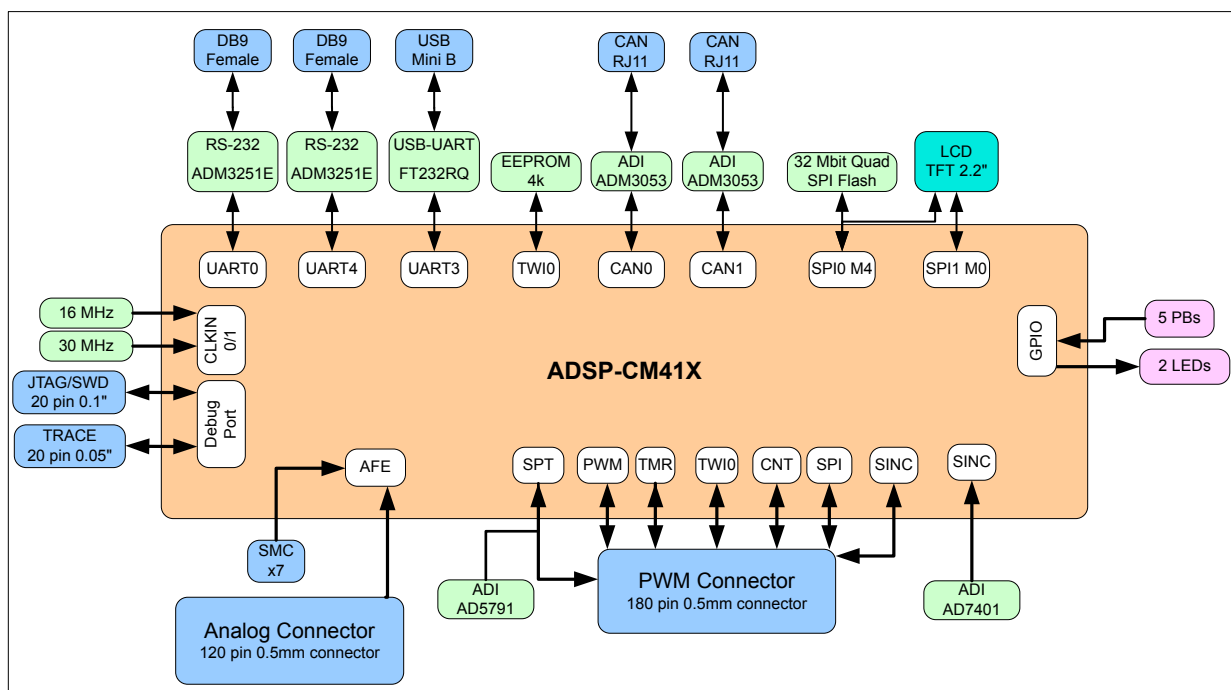


Figure 3-1: Block Diagram

This EZ-KIT is designed to demonstrate the ADSP-CM419F processor's capabilities. The board has a 30 MHz input clock and runs at 240 MHz internally.

User I/O to the processor is provided in the form of five pushbuttons and three LEDs.

Switches

This section describes operation of the switches. The switch locations are shown in the *Switch Locations* figure.

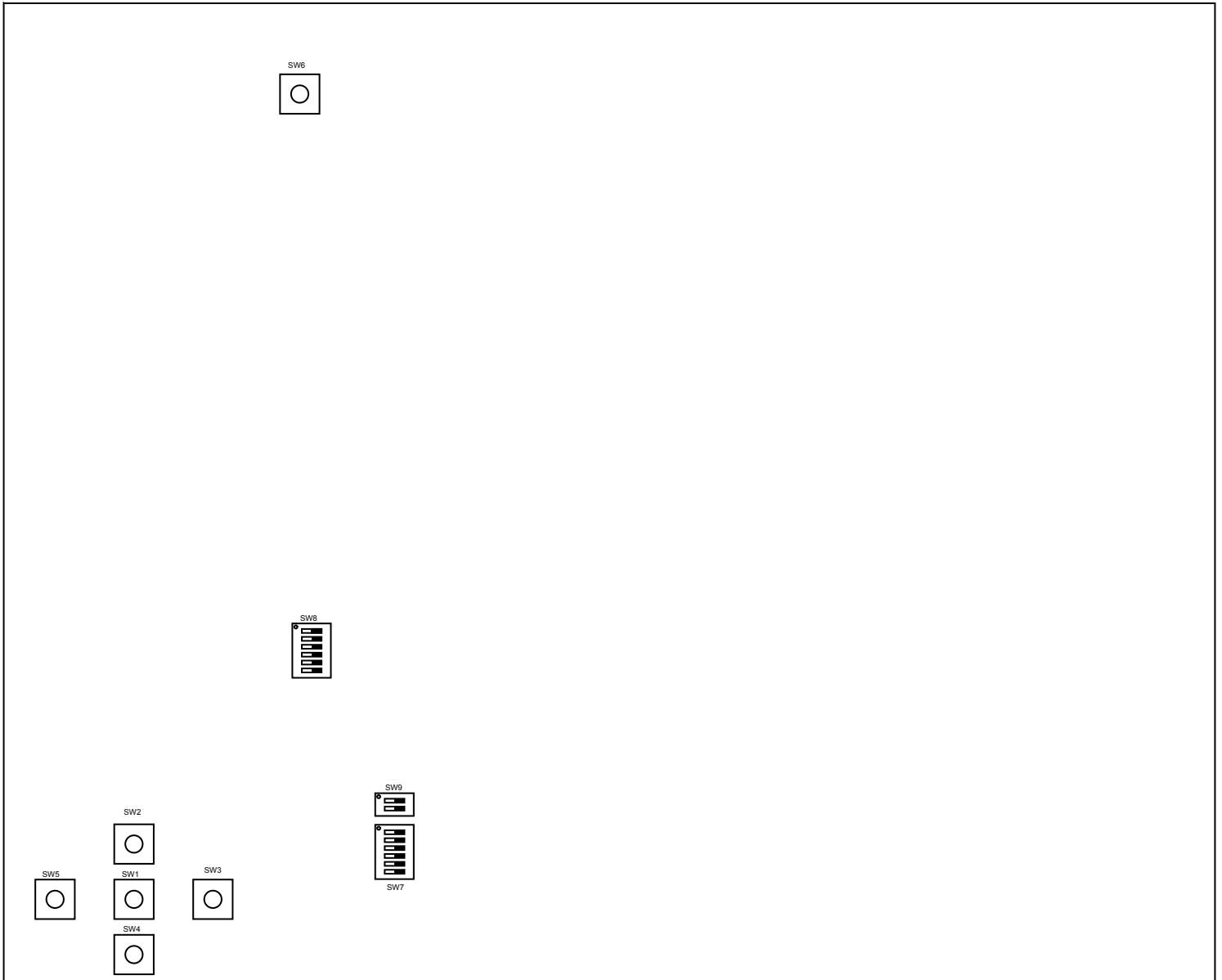


Figure 3-2: Switch Locations

Reset Pushbutton (SW6)

The reset pushbutton resets the ADSP-CM419F processor. The reset signal also is connected to the expansion connectors via the `SYS_HWRST` signal. [Reset \(LED4 \)](#) is used to indicate when the board is in reset.

GPIO Pushbuttons (SW1-5)

The GPIO pushbuttons are connected to the processor's signals PF_08/SPI1_SEL7/LBA_PIN5/SYS_DSWAKE2, PA_00/SPI0_SEL2/TM0_CLK/SPI0_SS, PA_01/SPI0_SEL3/SPI0_RDY/TM0_ACI2, PE_14/TM1_TMR0/SMC0_A05 and PE_15/TM1_TMR1/SMC0_A10, respectively. Each individual pushbutton is connected/disconnected from the processor by [Pushbutton Enable \(SW7 \)](#)

Wake Push Button PB1 is connected to one of the Wake Up signals of the DPM Deep Sleep mode of operation. A Monostable Pulse Generator (One Shot) IC is provided for the wake-up signal

Pushbutton Enable (sw7)

The Pushbutton enable switch is used to connect/disconnect the pushbuttons from the processor. When the switch is in the ON position the respective pushbutton is connected to the processor. When the switch is in the OFF position the respective pushbutton is disconnected from the processor and the signal can be used for another function. The *Pushbutton Enable Switch* table shows the available settings. By default, all positions of the switch are ON.

Table 3-1: Pushbutton Enable Switch

<i>Position</i>	<i>Pushbutton</i>	<i>Processor Signal</i>
1	SW1	PF_08/SPI1_SEL7/LBA_PIN5/SYS_DSWAKE2
2	SW2	PA_00/SPI0_SEL2/TM0_CLK/SPI0_SS
3	SW3	PA_01/SPI0_SEL3/SPI0_RDY/TM0_ACI2
4	SW4	PE_14/TM1_TMR0/SMC0_A05
5	SW5	PE_15/TM1_TMR1/SMC0_A10
6	NA	Not Used

SPI Flash Enable (sw8)

The SPI flash enable switch is used to connect/disconnect the SPI Flash from the processor. When the switch is in the ON position the respective signal is connected between the SPI flash and the processor. When the switch is in the OFF position the respective signal is disconnected between the SPI flash and the processor and the signal can be used for another function. The *SPI Flash Enable Switch* table shows the available settings. By default, all positions of the switch are ON.

Table 3-2: SPI Flash Enable Switch

<i>Position</i>	<i>Processor Signal</i>
1	PA_09/SPI0_MOSI/TM0_ACLK0
2	PA_08/SPI0_CLK/TM0_ACLK3
3	PA_11/SPI0_SEL1/SYS_DSWAKE3
4	PA_02/SPI0_D2/UART0_RTS/SPI0_SEL6/TM0_ACI3

Table 3-2: SPI Flash Enable Switch (Continued)

<i>Position</i>	<i>Processor Signal</i>
5	PA_03/SPI0_D3/UART0_CTS/SPI0_SEL7/TM0_ACI4
6	PA_10/SPI0_MISO/TM0_ACLK1

LED Enable (sw9)

The LED enable switch is used to connect/disconnect the LEDs from the processor. When the switch is in the ON position the respective signal is connected between the LED and the processor. When the switch is in the OFF position the respective signal is disconnected between the LED and the processor and the signal can be used for another function. The *LED Enable Switch* table shows the available settings. By default, all positions of the switch are ON.

Table 3-3: LED Enable Switch

<i>Position</i>	<i>LED</i>	<i>Processor Signal</i>
1	LED2	PA_13/TM0_TMR1
2	LED3	PF_02/SPI1_SEL4/SMC0_A08

Jumpers

This section describes functionality of the configuration jumpers. The *Jumper Locations* figure shows the jumper locations.

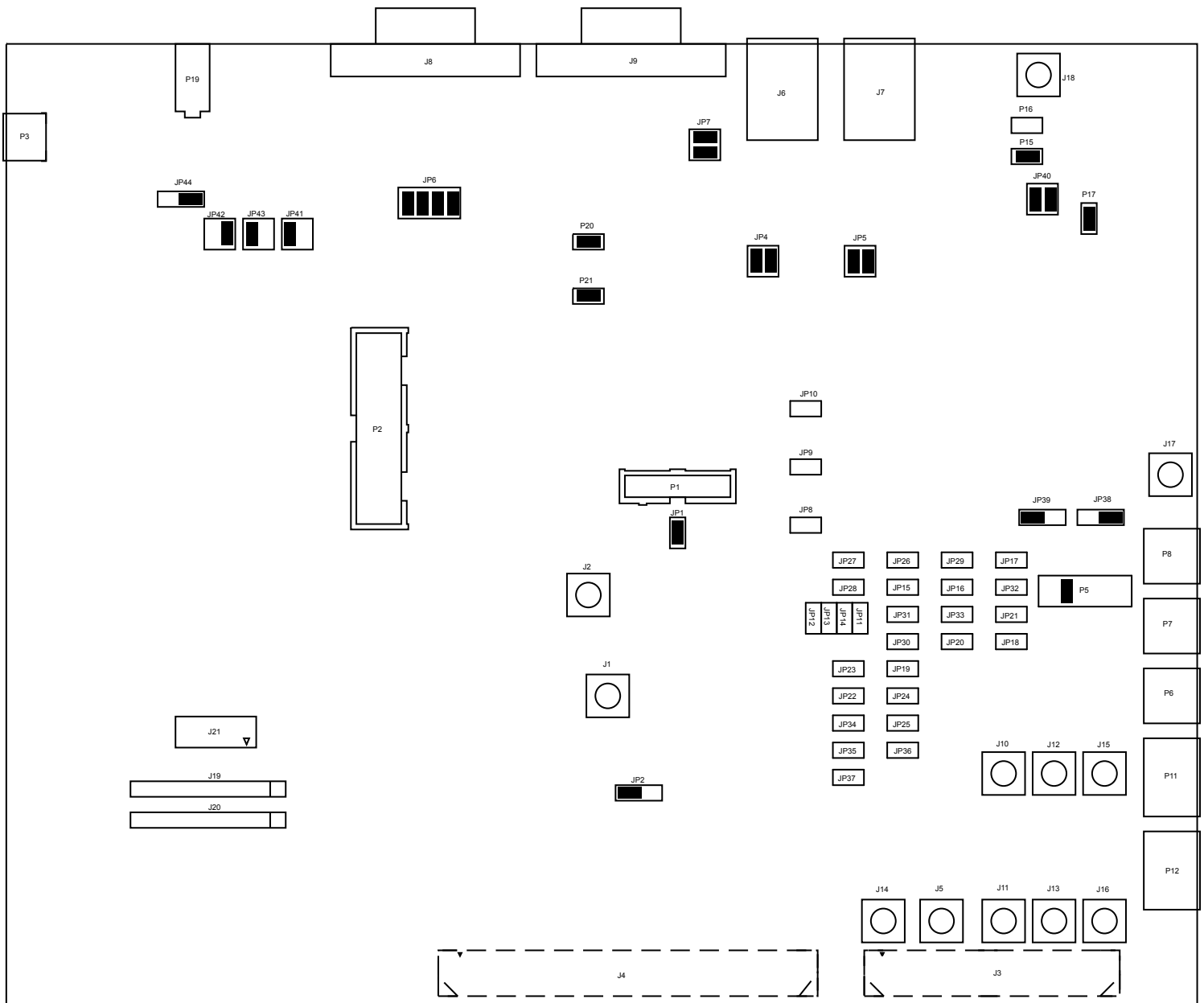


Figure 3-3: Jumper Locations

Boot Mode Select (JP1)

The Boot Mode selection jumper selects between the two boot modes of the processor. When a jumper is not installed (default), the BMODE will be 0 which corresponds to direct code execution from flash up on a reset. When a jumper is installed, the BMODE will be 1 which corresponds to boot from UART. The pushbutton switch determines the boot mode of the processor. The *Boot Mode Jumper* table shows the available boot mode settings. By default, the processor boots from the internal flash memory.

Table 3-4: Boot Mode Jumper

<i>Position</i>	<i>Processor Boot Mode</i>
installed	UART download mode
<i>not installed</i>	<i>Flash boot. Boot from integrated flash memory.</i>

VDD_INT Regulator Select (JP2)

The VDD_INT regulator select jumper selects whether an internal or external voltage regulator supplies the VDD_INT power to the processor. When a jumper is installed between pins 1 & 2 (default), the internal voltage regulator supplies VDD_INT. When a jumper is installed between pins 2 & 3, the the external voltage regulator supplies VDD_INT. The *VDD_INT Regualtor Select Jumper* table shows the available modes for supplying power to VDD_INT. By default, VDD_INT is supplied by the internal regulator.

Table 3-5: VDD_INT Regulator Select Jumper

<i>Position</i>	<i>VDD_INT Source</i>
<i>1 and 2</i>	<i>Internal regulator</i>
2 and 3	External regulator

CAN Interface (JP4 and JP5)

The CAN interface jumpers are used to connect/disconnect the CAN transmit and receive signals from the processor to the ADM3053. When the jumpers are installed on pins 1 - 2 and pins 3 - 4 the CAN data signals are connected between the processor and ADM3053. When the jumpers are not installed the signals are not connected and may be used for other functions on the board. The default setting is that all jumpers are installed.

Table 3-6: CAN Interface Jumper (JP4)

<i>Position</i>	<i>Processor Signal</i>
1 and 2	PA_07/CAN0_TX/SPI0_SEL5/TM0_ACLK2
3 and 4	PA_06/CAN0_RX/SPI0_SEL4/TM0_AC11

Table 3-7: CAN Interface Jumper (JP5)

<i>Position</i>	<i>Processor Signal</i>
1 and 2	PE_13/CAN1_TX/SMC0_ABE0
3 and 4	PE_12/CAN1_RX/SMC0_ABE1/TM1_AC10

UART Interface(JP6 and JP7)

The UART interface jumper (JP6) is used to used to connect/disconnect the UART4 signals (transmit, receive and flow control) with the RS-232 transciever IC ADM3252E and RS-232 connector. When the jumpers are not

installed the signals are not connected and may be used for other functions on the board. By default, jumpers 1-2, 3-4, 5-6 and 7-8 are installed; they must be populated to run the UART boot mode.

The RS-232 interface jumper (JP7) is used to connect/disconnect the UART0 signals (transmit and receive) with the RS-232 transceiver IC ADM3252E and RS-232 connector. When the jumpers are not installed the signals are not connected and may be used for other functions on the board. By default, jumpers 1-2 and 3-4 are installed. Hardware Flow Control is not supported for this interface.

The *UART Interface Jumper* table shows the available settings. By default, all positions of the switch are ON.

Table 3-8: UART Interface Jumper (JP6)

<i>Position</i>	<i>Processor Signal</i>
1 and 2	PF_04/UART4_TX/SMC0_A13/LBA_PIN1
3 and 4	PE_01/PWM2_AL/UART4_RTS/SMC0_AMS1
5 and 6	PF_05/UART4_RX/SPI1_SEL5/LBA_PIN2/TM1_ACI6
7 and 8	PE_03/PWM2_BL/UART4_CTS/SMC0_A15

Table 3-9: UART Interface Jumper (JP7)

<i>Position</i>	<i>Processor Signal</i>
1 and 2	PA_05/UART0_TX/TM0_ACLK4
3 and 4	PA_04/UART0_RX/TM0_ACI0

VREF Source (JP8 - JP10)

The VREF source jumpers select whether an internal or external voltage reference supplies the VREF0, VREF1 and VREF2 signal of the processor. When a jumper is not installed (default), the internal voltage reference supplies VREF0, VREF1 and VREF2. When a jumper on is installed, the external Analog Devices ADR441 ultra-low noise voltage reference supplies VREF0, VREF1 and VREF2.

ADC VIN0 A0 (JP11 - JP14)

The ADC VIN0 A0 jumper selects the source of the VIN0_A0 signal on the processor. Only one jumper should be installed at a time.

The *ADC VIN0 A0 Jumper* table shows the available settings. By default, JP13 is installed.

Table 3-10: ADC VIN0 A0

<i>Jumper</i>	<i>Reference Signal</i>
JP11	ADC_VIN_A0_EXP
JP12	AIN_DUT1
JP13	AIN_DUT0

Table 3-10: ADC VIN0 A0 (Continued)

<i>Jumper</i>	<i>Reference Signal</i>
JP14	DAC_TEST_SOURCE

AIN DUT (JP15 - JP37)

Are we keeping these jumpers???????

DC Bias Source(JP38 and JP39)

The DC bias source jumper is used for configuring the bias used for the signal conditioning circuitry.

When a jumper is installed on pins 1 and 2 of JP38 a precision voltage reference(ADR443) of 0.75 is enabled.

When a jumper is installed on pins 2 and 3 an external reference voltage should be applied to [DC Bias \(J17 \)](#). By default a jumper is installed on pins 1 and 2.

When a jumper is installed on pins 1 and 2 of JP39 the unity gain buffer is bypassed. When a jumper is installed on pins 2 and 3 the precision voltage reference output configured on JP38 is connected to the unity gain buffer input. By default a jumper is installed on pins 2 and 3.

This jumper is used in conjunction with [DC Bias Select \(P5 \)](#)

SINC Interface(JP40)

The SINC interface jumper is used to connect/disconnect the SINC data and clock signals between the processor and the AD7401. When the jumpers are not installed the signals are not connected and may be used for other functions on the board.

The *SINC Interface Jumper* table shows the available settings. By default, jumpers 1-2 and 3-4 are installed.

Table 3-11: SINC Interface Jumper

<i>Position</i>	<i>Processor Signal</i>
1 and 2	PF_00/SINC0_D2/SMC0_A06
3 and 4	PC_15/SINC0_CLK0/UART1_RTS/SPT0_ATDV/TM1_ACLK3

Main Power Select (JP44)

The main power select jumper selects whether the main power source for the board is provided from the wall transformer or an optional 5V external source. Refer to the *Main Power Select Jumper* table. The default setting is to power the board from the wall power adapter.

Table 3-12: Main Power Select Jumper

<i>Position</i>	<i>Power Source</i>
1 and 2	Wall 5V
2 and 3	5V Input

DC Bias Select (P5)

The DC bias jumper provides DC BIAS for all the required signal conditioning circuitry. This jumper is used in conjunction with [DC Bias Source\(JP38 and JP39 \)](#)

The *DC Bias Select Jumper* table shows the available settings. By default, positions 3-4 are populated.

Table 3-13: DC Bias Select Jumper

<i>Position</i>	<i>Bias Signal</i>
1 and 2	DC_BIAS0
3 and 4	DC_BIAS1
5 and 6	DC_BIAS2
7 and 8	DC_BIAS3
9 and 10	DC_BIAS4
11 and 12	DC_BIAS5

Isolated Power (P15)

The isolated Power jumper connects the isolated 5V supply from ADUM6000 to the SIGMA DELTA ADC AD7401. By default this jumper is installed.

Single Ended Input (P16)

The single ended input jumper is used to provide a single ended input to the sigma delta converter. By default this jumper is not installed.

AD7401 Power (P17)

When the AD7401 power jumper is installed the 3.3V supply is connected to the Modulator AD7401 for its serial I/O pins. By default this jumper is installed.

Current Measurement (P20 and P21)

The current measurement jumpers are used to measure the current draw of the VDD_EXT of the processor and 3V IO power rail. The default is for both jumpers to be installed. To measure the current draw of the VDD_EXT of the

processor, remove the jumper on P20 and measure the voltage across the precision resistor. The current can be calculated by dividing the measured voltage by the 0.051 ohm resistor. In order to measure the current draw on the 3V IO rail remove the jumper on P21 and measure the voltage across the precision resistor. The current can be calculated by dividing the measured voltage by the 0.051 ohm resistor.

LEDs

This section describes the on-board LEDs. The *LED Locations* figure shows the LED locations.

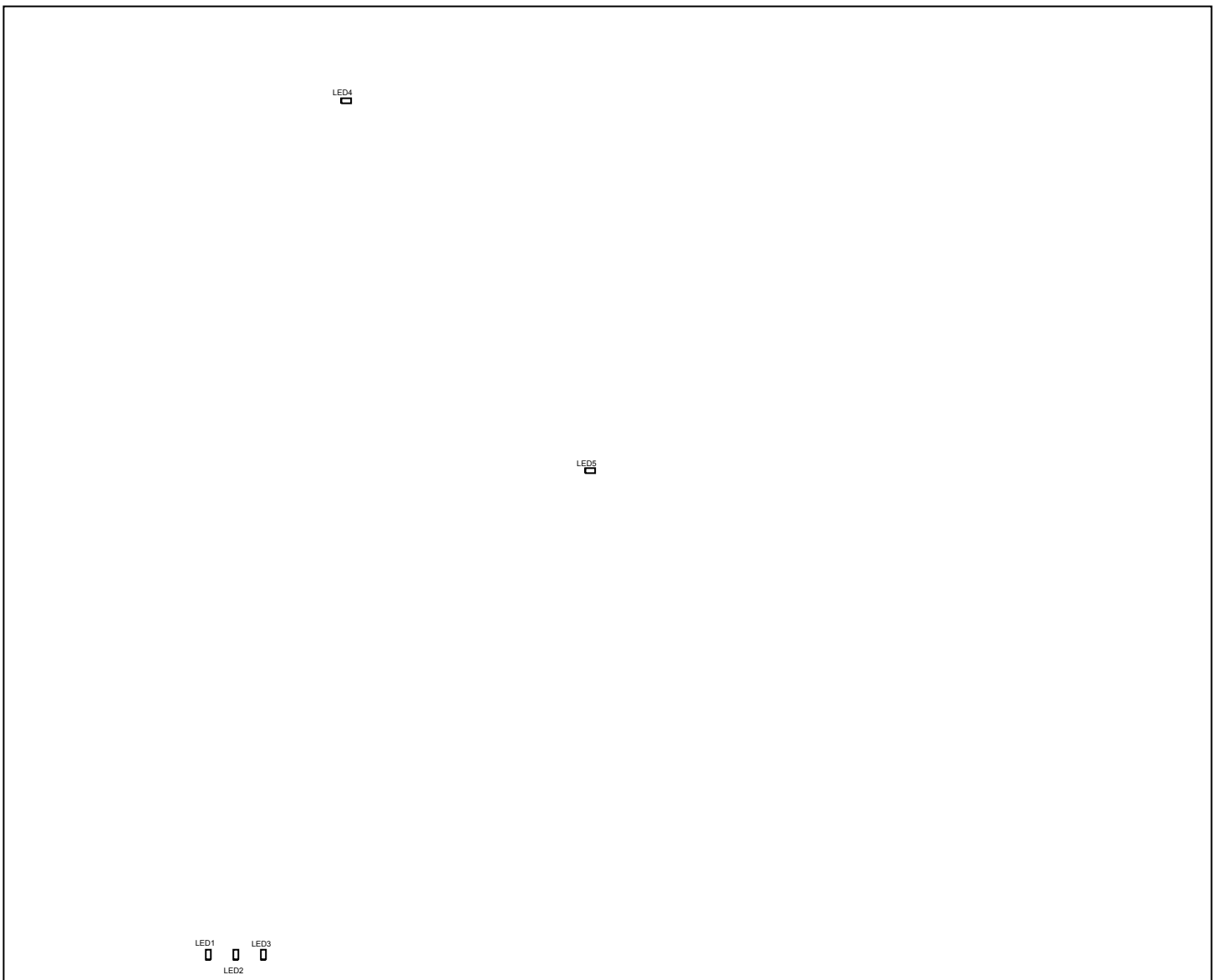


Figure 3-4: LED Locations

Power (LED1)

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

GPIO (LED2-3)

Three LEDs are connected to the general-purpose I/O pins of the processor (see the *GPIO LEDs* table). The LEDs are active high and are ON (amber) by writing a 1 to the correct processor signal.

Table 3-14: GPIO LEDs

<i>LED Reference Designator</i>	<i>Processor Programmable Flag Pin</i>
<i>LED3</i>	P0_13
<i>LED4</i>	P1_12
<i>LED5</i>	P1_13

Reset (LED4)

When ON (red), it indicates that the board is in reset. A master reset is asserted by pressing SW6 , which activates the LED. For more information, see [Reset Pushbutton \(SW6 \)](#).

Fault (LED5)

When ON, it indicates a system fault. For more information, refer to the ADSP-CM41x Mixed-Signal Control Processor Hardware Reference.

Connectors

This section describes connector functionality and provides information about mating connectors. The connector locations are shown in the *Connector Locations* figure.

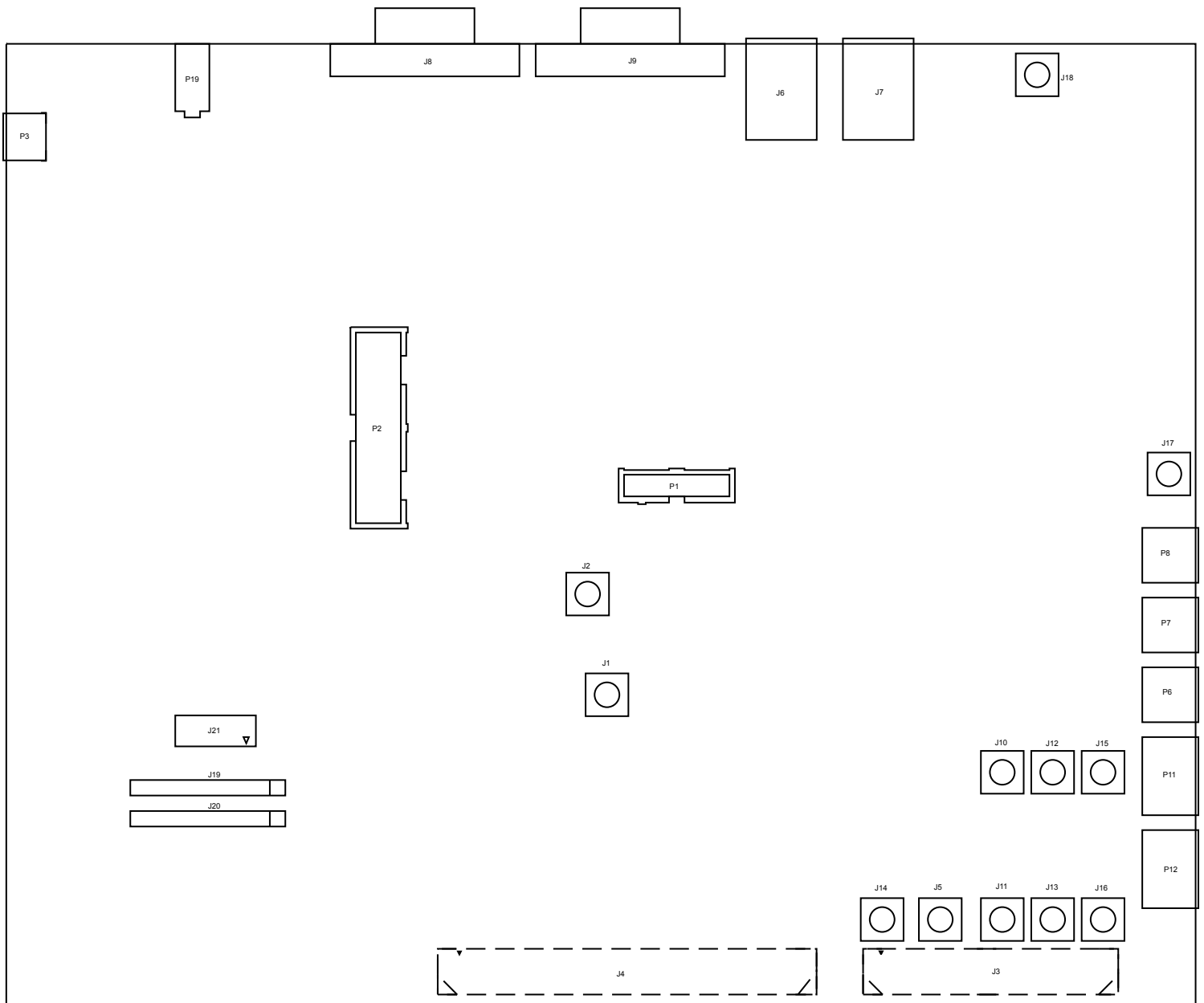


Figure 3-5: Connector Locations

NOTE: Connectors on the back of the board are noted with dotted lines.

Clock (J1 and J2)

The clock connectors allow for a connection point to the SYS_CLK1 and SYS_CLK2 signals on the processor.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMC 75 ohms	Amphenol	152119-75

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
<i>Mating Cable</i>		
SMC cable		

Analog Interface (J3)

One board-to-board connector provides signals to the ADC interfaces of the processor. This connector is located on the bottom side of the board. The connector expands the board's capabilities by providing an interface to daughterboards.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
120-pin 0.5mm	Samtec	QSH-060-F-D_A
<i>Mating Connector</i>		
120-pin 0.5mm	Samtec	QTH-060-01-F-D-A

PWM Interface (J4)

One board-to-board connector provides signals from the PWM, SINC, TWI, SPI, SPORT, and GPIO interfaces of the processor. This connector is located on the bottom side of the board. The connector expands the board's capabilities by providing an interface to daughterboards.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
180-pin 0.5mm	Samtec	QSH-090-F-D_A
<i>Mating Connector</i>		
180-pin 0.5mm	Samtec	QTH-090-01-F-D-A

DAC0 VOUT(J5)

The DAC0 VOUT connector provides a measurement point for the processor signal.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMC 75 ohms	Amphenol	152119-75
<i>Mating Cable</i>		
SMC cable		

CAN (J6 and J7)

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
RJ11	TE Connectivity	5558872-1
<i>Mating Cable</i>		
RJ11 cable		

UART (J8 and J9)

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
DB9 Female	Norcomp	191-009-213-L-571
<i>Mating Cable</i>		
DB9 cable		

ADC Input (J10–J13, J15 and J16)

The ADC input connectors provide a connection point for the input to the unity gain buffers.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMC 75 ohms	Amphenol	152119-75
<i>Mating Cable</i>		
SMC cable		

DC Bias (J17)

The DC bias connector is used to provide an external connection point for supplying a DC bias to the unity gain buffer by installing a jumper on pins 2 and 3 of JP38.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMC 75 ohms	Amphenol	152119-75
<i>Mating Cable</i>		
SMC cable		

Sense (J18)

The sense connector provides a connection point for supplying a signal to the AD7401.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMC 75 ohms	Amphenol	152119-75
<i>Mating Cable</i>		

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMC cable		

LCD (J19 and J20)

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
10x1 IDC Header.1"	Samtec	SSW-110-01-T-S
<i>Mating Daughterboard</i>		
2.2" TFT LCD	Adafruit	1480

Character Display (J21)

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
5x2 IDC Header.1"	Samtec	SSW-105-22-F-D-VS
<i>Mating Daughterboard</i>		
20x2 character display	Newhaven Display	NHD-0220D3Z-FL-GBW-V3

Debug (P1 and P2)

The debug connectors provides a connection point for the emulator to interface with the processor. There are two debug connectors on the board. The P4 connector is a 0.1" 20 pin connector. The P5 connector is a 0.05" 10 pin connector. For more information, see [Debug Interface](#).

USB (P3)

The USB connector provides an interface between the EZ-KIT and a host PC via the [USB to UART \(FT232R\)](#).

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
USB mini-B	Hirose	UX60SC-MB-5S8

AFE Supply (P6 - P9, P11 and P12)

The AFE supply connectors provide a connection point to supply the analog power by an external power supply.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
2 pin terminal block header 3.81mm	Phoenix	1803277
<i>Mating Connector</i>		
2 pin terminal block plug 3.81mm	Phoenix	?

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
3 pin terminal block header 3.81mm	Phoenix	1803280
<i>Mating Connector</i>		
3 pin terminal block plug 3.81mm	Phoenix	?

Power (P19)

The power connector provides power to the board when the jumper of [Main Power Select \(JP44 \)](#) is placed on pins 1 and 2.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
0.65 mm power jack	CUI	045-0883R
<i>Mating Connector</i>		
5.0VDC@3.6A power supplier	GLOBETEK	GS-1750(R)

