

# ***ADSP-SC573 EZ-KIT*® Manual**

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# Regulatory Compliance

The *ADSP-SC573 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-SC573 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-SC573 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.



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# 1 Preface

Thank you for purchasing the Analog Devices, Inc. *ADSP-SC573 EZ-KIT* evaluation system.

The ADSP-SC573 processor is a members of the SHARC<sup>®</sup> family of products. The ADSP-SC573 processor is based on the SHARC+ dual-core and the ARM<sup>®</sup> Cortex-A5™ core. The ADSP-SC573SHARC processor is a members of the SIMD SHARC family of DSPs that feature Analog Devices Super Harvard Architecture. These 32-bit/40-bit/64-bit floating-point processors are optimized for high performance audio/floating-point applications with their large onchip SRAM, multiple internal buses to eliminate I/O bottlenecks, and innovative digital audio interfaces (DAI). New enhancements to the SHARC+ core add cache enhancements, branch prediction, and other instruction set improvements—all while maintaining instruction set compatibility to previous SHARC products. 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 expansion interface 3 (EI3). This interface provides 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 CrossCore Embedded Studio<sup>®</sup> 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 SHARC+ and ARM Cortex-A5 core. The ADSP-SC57x family of processors is based on the SHARC+ and ARM Cortex-A5 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-SC57x processor, but does not provide detailed programming information.

The applicable documentation for programming the SHARC+ and ARM Cortex-A5 core includes:

- *CoreSight ETM-A5 Technical Reference Manual*
- *Cortex-A5 Technical Reference Manual*
- *ADSP-SC57x Data Sheet*
- *ADSP-SC57x Hardware Reference Manual*
- *ADSP-SC57x Programmers 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/SC573EZKIT> .
- *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/SC573EZKIT> .

## 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<sup>®</sup>:  
<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*<sup>®</sup> or *VisualDSP++*<sup>®</sup>:

If using CrossCore Embedded Studio or VisualDSP++ choose *Help > Email Support*. This creates an e-mail to [processor.tools.support@analog.com](mailto: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](mailto:processor.tools.support@analog.com)

[processor.china@analog.com](mailto: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:

Analog Devices, Inc.

One Technology Way

P.O. Box 9106

Norwood, MA 02062-9106

USA

## Supported Processors

This evaluation system supports the Analog Devices ADSP-SC573 processor.

## Supported Tools

Information about code development tools for the *ADSP-SC573 EZ-KIT* and ADSP-SC57x family of processors is available at:

<http://www.analog.com/SC573EZKIT>

## Product Information

Product information can be obtained from the Analog Devices Website and CCES online help.

## 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](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](http://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](http://MyAnalog.com) provides access to books, application notes, data sheets, code examples, and more.

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## 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>
<b>File &gt; Close</b>	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.

<i>Example</i>	<i>Description</i>
<b>NOTE:</b>	<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.
<b>CAUTION:</b>	<i>CAUTION:</i> Incorrect device operation may result if .. <i>CAUTION:</i> 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 <i>CAUTION:</i> appears instead of this symbol.
<b>ATTENTION:</b>	<i>ATTENTION:</i> 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 devices users. In the online version of this book, the word <i>ATTENTION:</i> appears instead of this symbol.

## 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-SC573 processor
  - 400 ball BGA
  - 25 MHz oscillator
- DDR3 Memory
  - 128Mx16 bit (2Gbit )
  - Micron MT41J128M16JT-125
  - 1.5V
- SPI Flash (SPI2) Memory
  - 128Mbit
  - Windbond 32M-bit Serial Flash Memory with Dual and Quad SPI (W25Q32)
  - Single/Dual/Quad SPI
- SPI EEPROM
  - Microchip 4K I<sup>2</sup>C Serial EEPROM (24AA04)
- Ethernet
  - Texas Instruments 10/100/1000 Ethernet Physical Layer (DP83865)
  - Broadcom BroadR-Reach<sup>®</sup> Single Port Automotive Ethernet Transceiver (BCM89810)
  - Cirrus Logic Fractional-N Clock Multiplier (CS2100)

- Two RJ45 connectors
- Audio
  - Analog Devices [12 Channel, High Performance, 192kHz, 24-Bit DAC \(ADAU1962A\)](#)
  - Analog Devices [Quad ADC with Diagnostics \(ADAU1977\)](#)
  - Analog Devices [Quad Analog-to-Digital Converter \(ADAU1979\)](#)
  - 12 RCA connectors. 12 outputs or 8 outputs/4 inputs
- Universal Asynchronous Receiver/Transmitter (UART3)
  - FTDI [USB to UART \(FT232R\)](#)
  - USB micro-B
- CAN
  - NXP [Enhanced fault-tolerant CAN transceiver \(TJA1055\)](#)
  - NXP [High-speed CAN transceiver for partial networking \(TJA1145\)](#)
  - Two RJ11 connectors
- A<sup>2</sup>B
  - Analog Devices [Automotive Audio Bus A<sup>2</sup>B Transceiver \(AD2410\)](#)
  - Two DuraClik connectors
- Debug Interface (JTAG and Trace)
  - ICE-1000 emulator
  - JTAG 10-pin 0.05” header
  - JTAG and Trace 38-pin Mictor connector
- LEDs
  - Eleven LEDs: one power (green), one board reset (red), eight general-purpose (amber) and one fault (red)
- Pushbuttons
  - Four pushbuttons: one reset and three IRQ/Flag
- EI3 connector
  - SMC
  - EPPI
  - SPORT
  - SPI

- UART
- TWI
- TMR
- GPIO
- RESET
- GND/3.3V/5V output
- External power supply
  - CE compliant
  - 12V @1.5 Amps
- Power measurement
  - 0.051-ohm resistors for measuring current draw

## Package Contents

Your *ADSP-SC573 EZ-KIT* package contains the following items.

- *ADSP-SC573 EZ-KIT* board
- Universal 12V DC power supply
- USB 2.0 type A to micro-B cable
- USB A receptacle to micro A plug
- Ethernet Cable
- SD Memory Card
- ICE-1000 emulator

Contact the vendor where you purchased your *ADSP-SC573 EZ-KIT* or contact Analog Devices, Inc. if any item is missing.

## Default Configuration

The *ADSP-SC573 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.

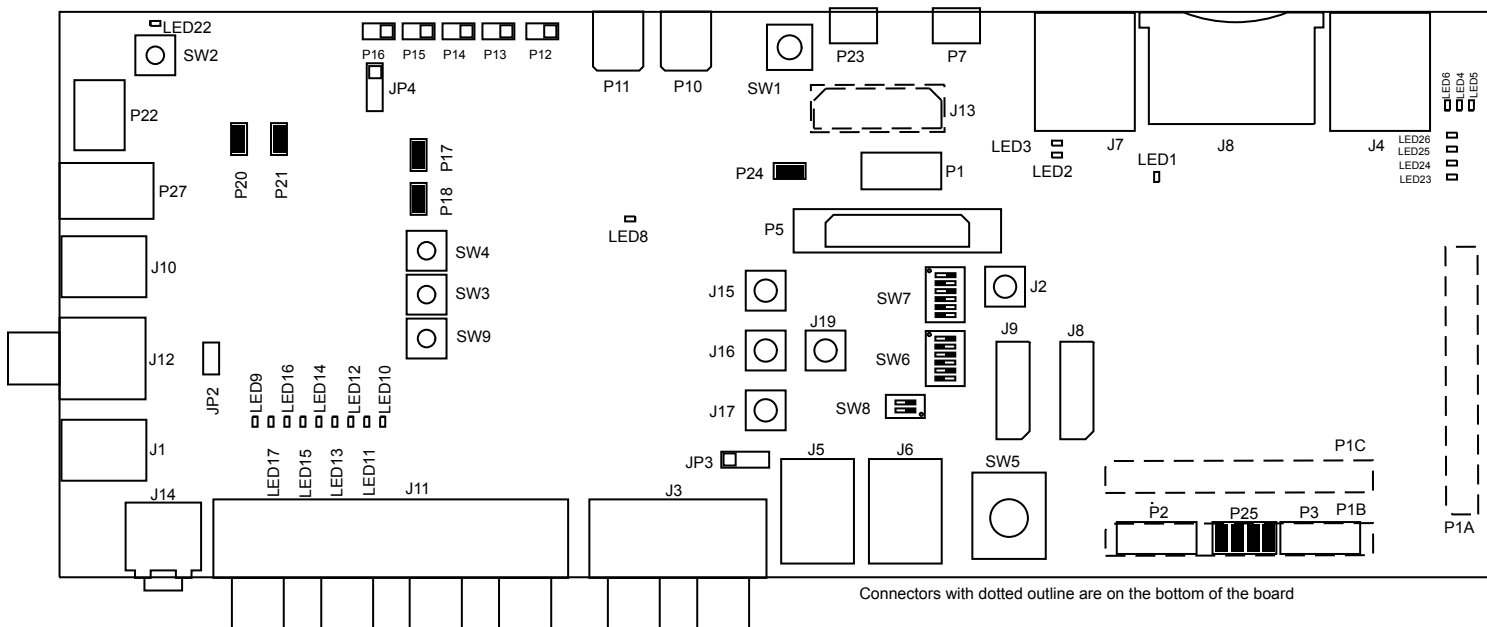


Figure 2-1: Default Hardware Setup

## CrossCore Embedded Studio Setup

For information about the CrossCore Embedded Studio<sup>®</sup> product and software download, go to:

<http://www.analog.com/en/design-center/processors-and-dsp/evaluation-and-development-software/adswt-cces.html>

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 CrossCore Embedded Studio<sup>®</sup>, using an 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 CrossCore Embedded Studio<sup>®</sup>.
  - b. Attach the emulator to the header connector, P1 or P5, on the EZ-KIT board.
2. Attach the provided cord and appropriate plug to the 12V power adapter:
  - a. Plug the jack-end of the power adapter into the power connector P22 on the EZ-KIT board.
  - b. Plug the other side of the power adapter into a power outlet. The power LED ( LED9 ) is lit green when power is applied to the board.

It is assumed that the CrossCore Embedded Studio<sup>®</sup> software is installed and running on your PC.

**NOTE:** If you connect the board or emulator first (before installing CCES) to the PC, the Windows driver wizard may not find the board drivers.



- Navigate to the CCES environment through the Start menu. Note that CCES is not connected to the target board.
- Use the Debug Configurations wizard to connect to the . If a debug configuration exists already, select the appropriate configuration and click Debug.
- To create a debug configuration choose Run > Debug Configurations.
- The Debug Configuration dialog box appears.
- Select Application with CrossCore Debugger and click the 'New' bottom to create a configuration. Then Select Processor page of the Session Wizard appears.
- Ensure SHARCis selected in Processor family. In Processor type, select ADSP-SC573. Click Next. The Select Connection Type page of the Session Wizard appears.
- Select Emulator and click Next.
- The Select Platform page of the Session Wizard appears.
- Choose the type of emulator that is connected to the *ADSP-SC573 EZ-KIT* .
- Click Finish to close the wizard. The new debug configuration is created and added to the Debug Configurations list.
- In the Name edit box, users can select an appropriate name to describe the configuration, otherwise a default name is provided.
- In the section, choose the program to load (if the appropriate program is not already populated) when connecting to the board. If not loading any program upon connection to the target, do not make any changes.
- While connected to the target, there is no way to choose a program to download. To load a program once connected, terminate the session and then load the new program.
- To delete a configuration, go to the Debug Configurations dialog box and select the 'Delete' button and choose Yes when asked if you wish to delete the selected launch configuration. Then Close the dialog box.
- To disconnect from the target board, choose Run > Terminate.
- The default configurations that show up in the CCES Debug Configurations wizard are for JTAG mode debugging only.

## Debug Interface

The *ADSP-SC573 EZ-KIT* provides a JTAG and Traceconnection via P1 and P5 .

## 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.

## Power Measurements

Locations are provided for measuring the current draw from various power planes. Precision 0.051 ohm shunt resistors are available on the 1.5V, `VDD_INT` 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-SC573 EZ-KIT* Board Support Package (BSP) to demonstrate various capabilities of the product. The programs can be found in the `ADSP-SC573_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/SC573EZKIT>

## 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.

## Automotive Audio Bus A<sup>2</sup>B Transceiver (AD2410)

The Automotive Audio Bus (A<sup>2</sup>B™) provides a multi-channel, I2S/TDM link over distances of up to 10 meters between nodes. It embeds bi-directional synchronous data (for example digital audio), clock and synchronization signals onto a single differential wire pair. A<sup>2</sup>B supports a direct point-to-point connection and allows multiple, daisy chained nodes at different locations to contribute or consume time division multiplexed channel content. A<sup>2</sup>B is a single-master, multiple-slave system where the transceiver chip at the host controller is the master. It generates clock, synchronization and framing for all slave nodes. The master A<sup>2</sup>B chip is programmable over a control bus (I<sup>2</sup>C) for configuration and read back. An extension of this control bus is embedded in the A<sup>2</sup>B data stream allowing direct access of registers and status information on slave transceivers as well as I<sup>2</sup>C-to-I<sup>2</sup>C communication over distance.

## 12 Channel, High Performance, 192kHz, 24-Bit DAC (ADAU1962A)

The ADAU1962A is a high performance, single-chip digital-to-analog converter (DAC) that provides 12 DACs with differential or single-ended output using the Analog Devices, Inc., patented multibit sigma-delta ( $\Sigma$ - $\Delta$ ) architecture. A serial peripheral interface (SPI)/I2C port is included, allowing a micro-controller to adjust volume and many other parameters. The ADAU1962A operates from 2.5 V digital and 3.3 V analog supplies. A linear regulator is included to generate the digital supply voltage from the analog supply voltage.

The ADAU1962A is designed for low EMI. This consideration is apparent in both the system and circuit design architectures. By using the on-board PLL to derive the internal master clock from an external LRCLK, the ADAU1962A can eliminate the need for a separate high frequency master clock and can be used with or without a bit clock. The DACs are designed using the latest Analog Devices continuous time architectures to further minimize EMI.

## Quad ADC with Diagnostics (ADAU1977)

The ADAU1977 incorporates four high performance analog-to-digital converters (ADCs) with direct-coupled inputs capable of 10 V rms. The ADC uses multibit sigma-delta ( $\Sigma$ - $\Delta$ ) architecture with continuous time front end for low

EMI. The ADCs can be connected to the electret microphone (ECM) directly and provide the bias for powering the microphone. Built-in diagnostic circuitry detects faults on input lines and includes comprehensive diagnostics for faults on microphone inputs. The faults reported are short to battery, short to microphone bias, short to ground, short between positive and negative input pins, and open input terminals. In addition, each diagnostic fault is available as an IRQ flag for ease in system design. An I2C/SPI control port is also included. The ADAU1977 uses only a single 3.3 V supply. The part internally generates the microphone bias voltage. The microphone bias is programmable in a few steps from 5 V to 9 V. The low power architecture reduces the power consumption. An on-chip PLL can derive the master clock from an external clock input or frame clock (sample rate clock). When fed with a frame clock, the PLL eliminates the need for a separate high frequency master clock in the system.

## Quad Analog-to-Digital Converter (ADAU1979)

The ADAU1979 incorporates four high performance, analog-to-digital converters (ADCs) with 4.5 V rms capable ac-coupled inputs. The ADCs use a multibit sigma-delta ( $\Sigma$ - $\Delta$ ) architecture with continuous time front end for low EMI. An I2C/serial peripheral interface (SPI) control port is included that allows a microcontroller to adjust volume and many other parameters. The ADAU1979 uses only a single 3.3 V supply. The device internally generates the required digital DVDD supply. The low power architecture reduces the power consumption. The on-chip PLL can derive the master clock from an external clock input or frame clock (sample rate clock). When fed with the frame clock, it eliminates the need for a separate high frequency master clock in the system.

## 10/100/1000 Ethernet Physical Layer (DP83865)

The DP83865 is a fully featured Physical Layer transceiver with integrated PMD sublayers to support 10BASE-T, 100BASE-TX and 1000BASE-T Ethernet protocols.

The DP83865 is an ultra low power version of the DP83861 and DP83891. It uses advanced 0.18  $\mu$ m, 1.8 V CMOS technology, fabricated at National Semiconductor's South Portland, Maine facility.

The DP83865 is designed for easy implementation of 10/100/1000 Mb/s Ethernet LANs. It interfaces directly to Twisted Pair media via an external transformer. This device interfaces directly to the MAC layer through the IEEE 802.3u Standard Media Independent Interface (MII), the IEEE 802.3z Gigabit Media Independent Interface (GMII), or Reduced GMII (RGMII).

## BroadR-Reach<sup>®</sup> Single Port Automotive Ethernet Transceiver (BCM89810)

100 Mbps automotive Ethernet transceiver integrated into a single monolithic CMOS chip.

The device performs all of the physical layer functions for BroadR-Reach<sup>®</sup> encoded Ethernet packets over single-pair unshielded twisted-pair copper wire, such as FlexRay<sup>™</sup>. The BCM89810 is designed to exceed automotive specifications for noise cancellation and transmission jitter, providing consistent and reliable operation over the broadest range of single-pair twisted-pair automotive cable plants. The BCM89810 is based on Broadcom's proven

digital-signal processor technology, combining digital adaptive equalizers, ADCs, phase-locked loops, line drivers, encoders, decoders, echo cancelers and all other required support circuitry. The BCM89810 is designed to be fully compliant with RGMII and MII interface specifications, allowing compatibility with industry-standard Ethernet media access controllers (MACs) and switch controllers.

By default this transceiver is not supported on the board. Contact Analog Devices for more information on how to enable this interface.

## Fractional-N Clock Multiplier (CS2100)

The CS2100-CP is an extremely versatile system clocking device that utilizes a programmable phase lock loop. The CS2100-CP is based on a hybrid analog- digital PLL architecture comprised of a unique combination of a Delta-Sigma Fractional-N Frequency Synthesizer and a Digital PLL. This architecture allows for generation of a low-jitter clock relative to an external noisy synchronization clock at frequencies as low as 50 Hz. The CS2100-CP supports both I<sup>2</sup>C and SPI for full software control.

## Enhanced fault-tolerant CAN transceiver (TJA1055)

The TJA1055 is the interface between the protocol controller and the physical bus wires in a Controller Area Network (CAN). It is primarily intended for low-speed applications up to 125 kBd in passenger cars. The device provides differential receive and transmit capability but will switch to single-wire transmitter and/or receiver in error conditions. The TJA1055 is the enhanced version of the TJA1054 and TJA1054A. TJA1055 has the same functionality but in addition offering a number of improvements. The most important improvements of the TJA1055 with respect to the TJA1054 and TJA1054A are:

- Improved ElectroStatic Discharge (ESD) performance
- Lower current consumption in sleep mode
- Wake-up signaling on RXD and ERR without VCC active
- 3 V interfacing with microcontroller possible with TJA1055T/3

## High-speed CAN transceiver for partial networking (TJA1145)

The TJA1145 is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The transceiver is designed for high-speed CAN applications in the automotive industry, providing differential transmit and receive capability to (a microcontroller with) a CAN protocol controller.

The TJA1145 features very low power consumption in Standby and Sleep modes and supports ISO 11898-6 compliant CAN Partial Networking by means of a selective wake-up function.

Advanced power management regulates the supply throughout the node and supports local and remote wake-up functionality. I/O levels are automatically adjusted to the I/O levels of the controller, allowing the TJA1145 to

interface directly with 3.3 V to 5 V microcontrollers. An SPI interface is provided for transceiver control and for retrieving status information. Bus connections are truly floating when power is off.

These features make the TJA1145 the ideal choice for high-speed CAN networks containing nodes that are always connected to the battery supply line but, in order to minimize current consumption, are only active when required by the application.

## **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 utilizing 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

## Triple Channel, High Measurement, Shunt and Bus Voltage Monitor (INA3221)

The INA3221 is a three-channel, high-side current and bus voltage monitor with an I<sup>2</sup>C- and SMBUS-compatible interface. The INA3221 monitors both shunt voltage drops and bus supply voltages, in addition to having programmable conversion times and averaging modes for these signals. The INA3221 offers both critical and warning alerts to detect multiple programmable out-of-range conditions for each channel.

## 4K I<sup>2</sup>C 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  $\mu$ A and 1 mA, respectively. The 24XX04 also has a page write capability for up to 16 bytes of data.

## Expansion Interface 3

The Expansion Interface 3 (EI3) interface supports connecting with other EI3 daughterboards designed by Analog Devices, extending the evaluation system's capabilities. The connectors provide power, ground, reset, ADC, PPI, TWI, UART, SPORT, SMC and GPIO signals.

The expansion interface is architected to provide support for modularity with different expansion board types. These types fall into several categories including audio, video, converter, and asynchronous memory.

More information about available extender boards can be found at: <http://www.analog.com/en/design-center/landing-pages/001/sharc-processors-software-and-tools.html>

## 3 Hardware Reference

This chapter describes the hardware design of the *ADSP-SC573 EZ-KIT*.

### System Architecture

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



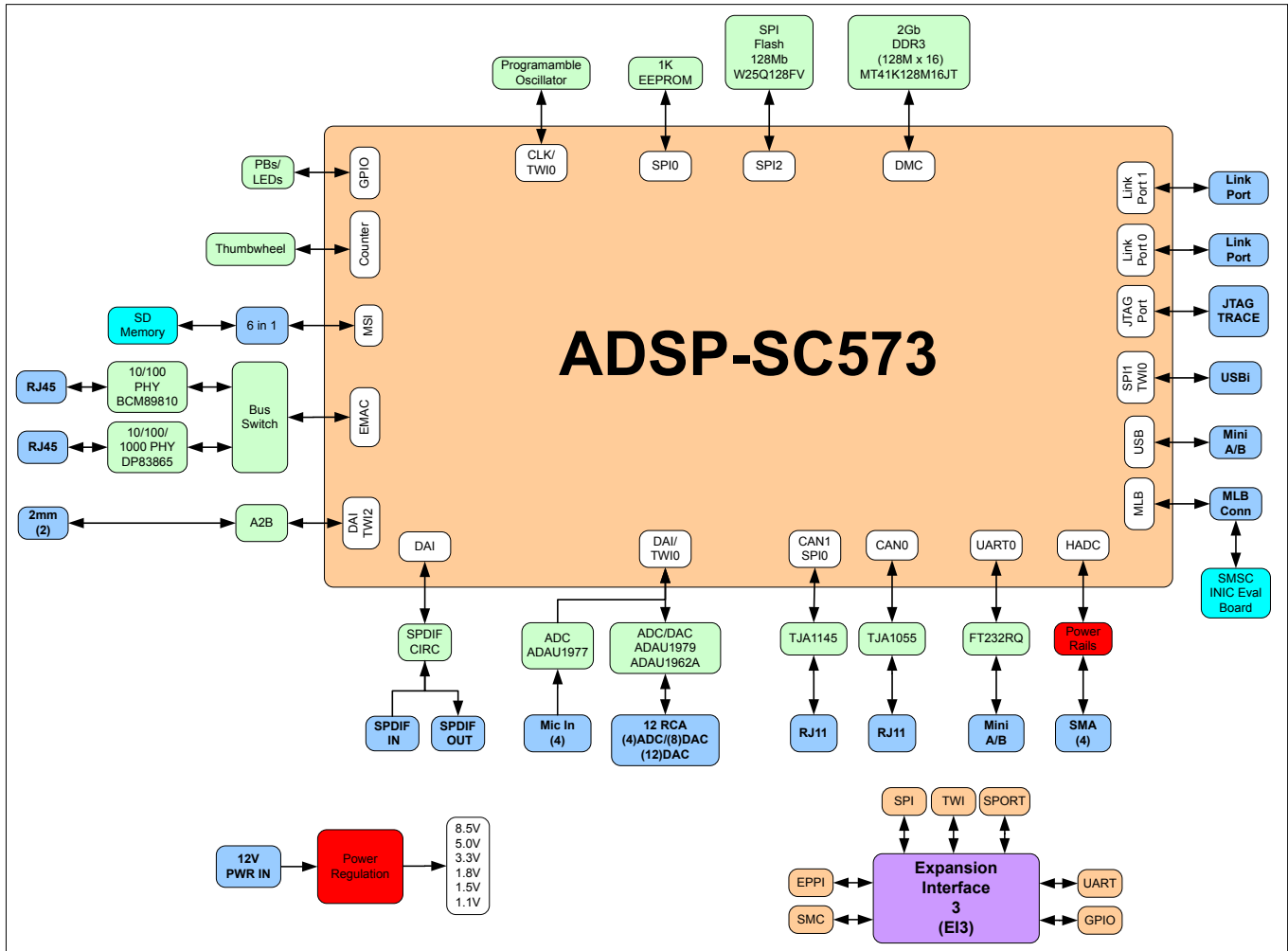


Figure 3-1: Block Diagram

This EZ-KIT is designed to demonstrate the ADSP-SC573 processor’s capabilities. The board has a 25 MHz input clock and runs at 450 MHz internally.

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

The software-controlled switches (SoftConfig) facilitate the switch multi-functionality by disconnecting the push-buttons from their associated processor pins and reusing the pins elsewhere on the board.

## Software-Controlled Switches (SoftConfig)

On the board, most of the traditional mechanical switches and jumpers have been replaced by I<sup>2</sup>C software-controlled switches. The remaining mechanical switches are provided for the boot mode and pushbuttons. Reference any `SoftConfig*.c` file found in the installation directory for an example of how to set up the SoftConfig feature of

the board through software. The SoftConfig section of this manual serves as a reference to any user that intends to modify an existing software example. If software provided by ADI is used, there should be little need to reference this section.

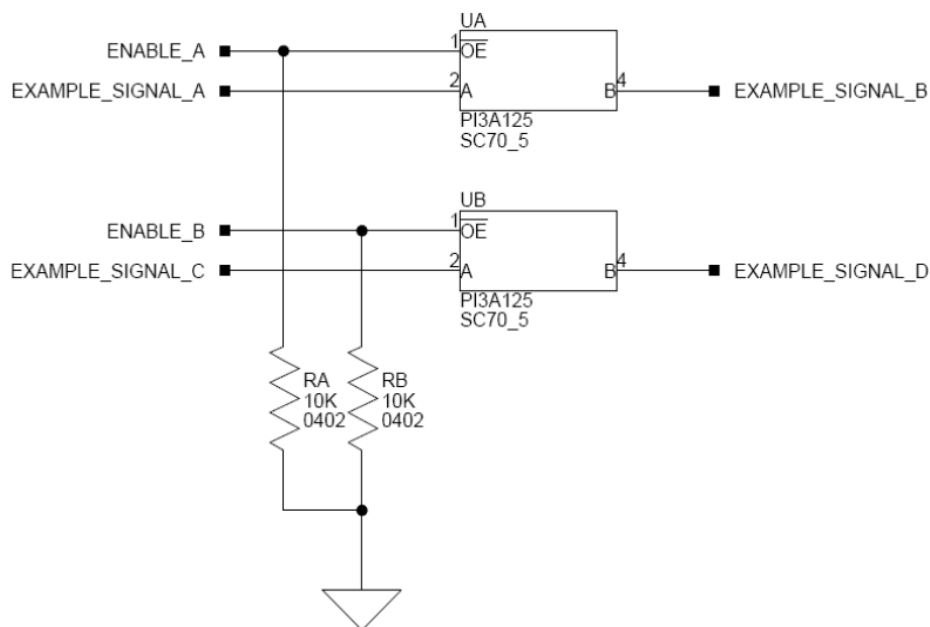
**NOTE:** Care should be taken when changing SoftConfig settings not to create a conflict with interfaces. This is especially true when connecting extender cards.

## Overview of SoftConfig

In order to further clarify the use of electronic single FET switches and multi-channel bus switches, an example of each is illustrated and compared to a traditional mechanical switching solution. This is a generic example that uses similar FET and bus switch components that are on the board.

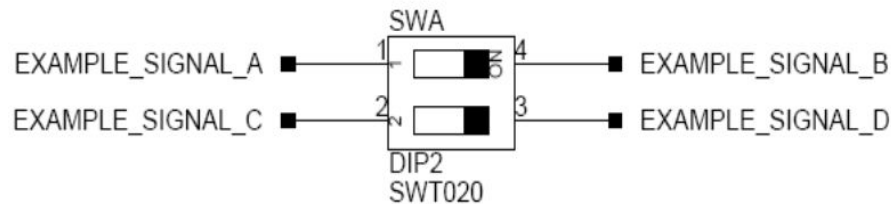
After this generic discussion there is a detailed explanation of the SoftConfig interface specific to the *ADSP-SC573 EZ-KIT*.

The *Example of Individual FET Switches* figure shows two individual FET switches (Pericom PI3A125CEX) with reference designators UA and UB. Net names `ENABLE_A` and `ENABLE_B` control UA and UB. The default FET switch enable settings in this example are controlled by resistors RA and RB which pull the enable pin 1 of UA and UB to ground (low). In a real example, these enable signals are controlled by the Microchip IO expander. The default pull-down resistors connects the signals `EXAMPLE_SIGNAL_A` and `EXAMPLE_SIGNAL_B` and also connects signals `EXAMPLE_SIGNAL_C` and `EXAMPLE_SIGNAL_D`. To disconnect `EXAMPLE_SIGNAL_A` from `EXAMPLE_SIGNAL_B`, the Microchip IO expander is used to change `ENABLE_A` to a logic 1 through software that interfaces with the Microchip. The same procedure for `ENABLE_B` disconnects `EXAMPLE_SIGNAL_C` from `EXAMPLE_SIGNAL_D`.



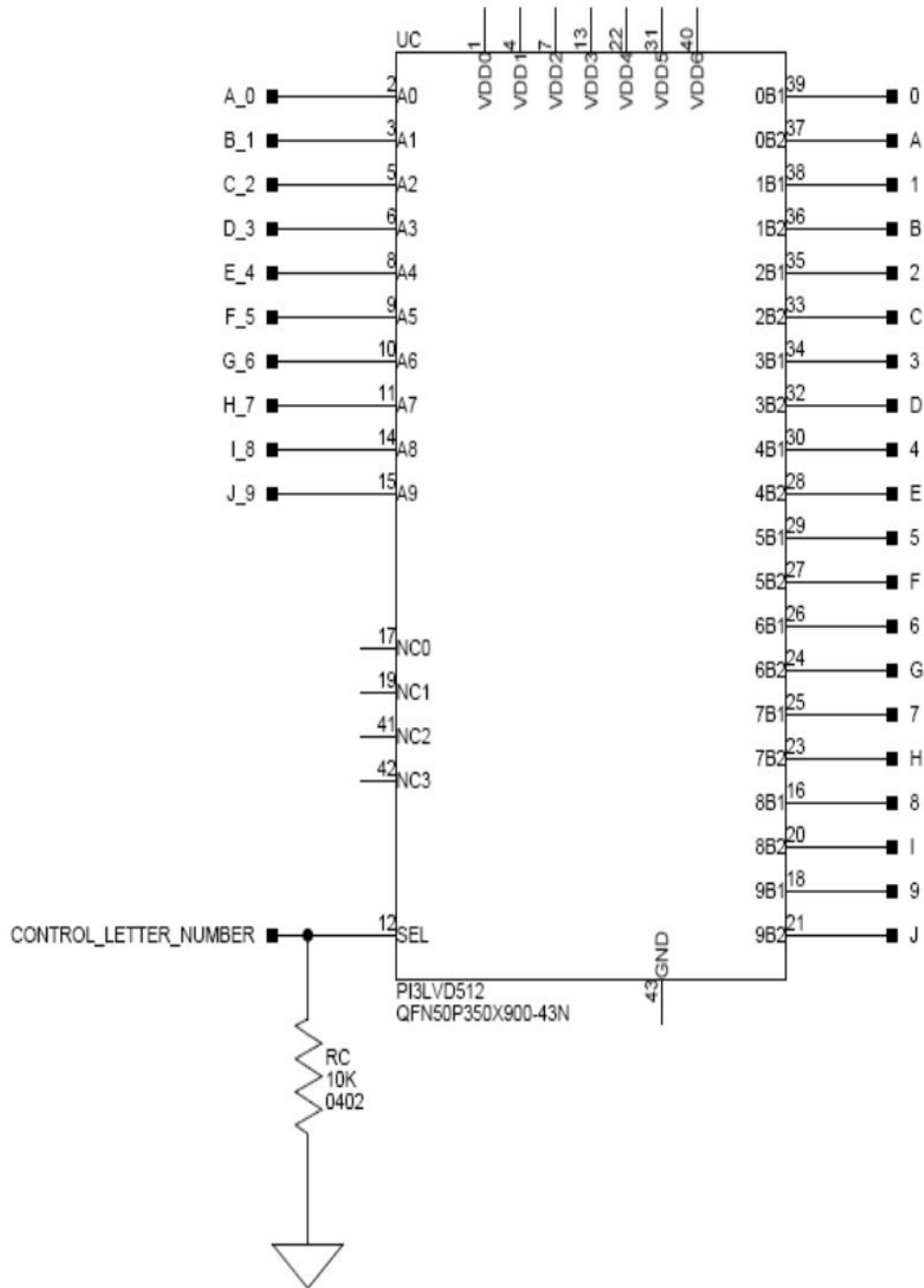
**Figure 3-2:** Example of Individual FET Switches

The following figure shows the equivalent circuit to the *Example of Individual FET Switches* figure but utilizes mechanical switches that are in the same package. Notice the default is shown by black boxes located closer to the *ON* label of the switches. In order to disconnect these switches, physically move the switch to the OFF position.



**Figure 3-3:** Example of a Mechanical Switch (Equivalent to Example of Individual FET Switches Figure)

The *Example of Bus Switch* figure shows a bus switch example, reference designator UC (Pericom PI3LVD512ZHE), selecting between lettered functionality and numbered functionality. The signals on the left side are multiplexed signals with naming convention letter\_number. The right side of the circuit shows the signals separated into letter and number, with the number on the lower group (0B1) and the letter on the upper group (0B2). The default setting is controlled by the signal CONTROL\_LETTER\_NUMBER which is pulled low. This selects the number signals on the right to be connected to the multiplexed signals on the left by default. In this example, the Microchip IO expander is not shown but controls the signal CONTROL\_LETTER\_NUMBER and allows the user to change the selection through software.



**Figure 3-4:** Example of a Bus Switch

The following figure shows the equivalent circuit to the *Example of Bus Switch* figure but utilizes mechanical switches. Notice the default for reference designators  $SW_C$  and  $SW_D$  is illustrated by black boxes located closer to the *ON* label of the switches to enable the number signals by default. Also notice the default setting for reference designators  $SW_E$  and  $SW_F$  is OFF. In order to connect the letters instead of the numbers, the user physically changes all switches on  $SW_C$  and  $SW_D$  to the OFF position and all switches on  $SW_E$  and  $SW_F$  to the ON position.

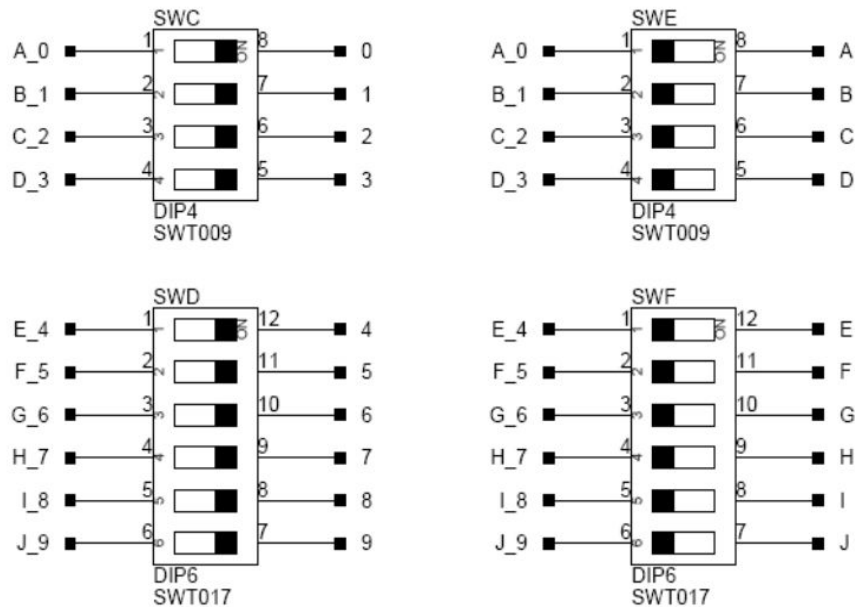


Figure 3-5: Example of a Mechanical Switch (Equivalent to Example of Bus Switch)

## SoftConfig on the Board

Two Microchip MCP23017 GPIO expanders provide control for individual electronic switches. The TWI0 interface of the processor communicates with the Microchip devices. There are individual switches with default settings that enable basic board functionality.

The *Default Processor Interface Availability* table lists the processor and board interfaces that are available by default. Note that only interfaces affected by software switches are listed in the table.

Table 3-1: Default Processor Interface Availability

Interface	Availability by Default
UART0	USB to UART FTDI232RQ
SPI Flash	Quad mode enabled
Audio Connectors	4 inputs/8 outputs
SD Card	Write protect enabled
S/PDIF Digital	S/PDIF RCA input and output connectors enabled
Pushbuttons	Enabled
LEDs	Enabled

## Programming SoftConfig Switches

On the board, two Microchip MCP23017 devices exist. Each of these devices have the following programming characteristics:

- Each GPIO register controls eight signals (software switches).

<i>GPIO Register</i>	<i>Register Address</i>
GPIOA	0x12
GPIOB	0x13

- By default, the Microchip MCP23017 GPIO signals function as input signals.

The signals must be programmed as output signals to override their default values. A zero is programmed into the register to enable the signal as an output. The following table shows the Microchip register addresses.

<i>IODIR Register</i>	<i>IODIR Register Address</i>
IODIRA	0x00
IODIRB	0x01

Each example in the Board Support Software (BSP) includes source files that program the soft switches, even if the default settings are being used. The README for each example identifies only the signals that are being changed from their default values. The code that programs the soft switches is located in the `SoftConfig_XXX.c` file in each example where XXX is the name of the board.

The following tables (*I<sup>2</sup>C Hardware Address 0x21* and *I<sup>2</sup>C Hardware Address 0x22*) outline the default values for each of the two Microchip MCP23017 devices.

Table 3-2: I<sup>2</sup>C Hardware Address 0x21

<i>GPIO</i>	<i>MCP23017 Register Address</i>	<i>Default Value</i>
GPIOA	0x12	0x02
GPIOB	0x13	0xC4

Table 3-3: I<sup>2</sup>C Hardware Address 0x22

<i>GPIO</i>	<i>MCP23017 Register Address</i>	<i>Default Value</i>
GPIOA	0x12	0xE0
GPIOB	0x13	0xFF

The board schematic shows how the two Microchip GPIO expanders are connected to the board's ICs.

Tables *Output Signals of Microchip GPIO Expander (U47 Port A)* and *Output Signals of Microchip GPIO Expander (U47 Port B)* show the output signals of the Microchip GPIO expander (U47), with a TWI address of 0100 001X, where X represents the read or write bit. The signals that control an individual FET have an entry in the *FET* column. The *Component Connected* column shows the board IC that is connected if the FET is enabled. The Microchip (U47) is controlling the enable signal of a FET switch. Also note that if a particular functionality of the processor signal is being used, it is in *bold* font in the *Processor Signal* column.

Table 3-4: Output Signals of Microchip GPIO Expander (U47 Port A)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Connected	Default
0	EEPROM_EN	SPI EEPROM CS	U23	PC_05/SPI0_SEL2b/ PPI0_D06/SPI0_RDY/ SMC0_ABE0b	U4	High
1	UART0_FLOW_EN	UART0 Flow Control	U27	PD_05/SPI0_SEL7b/ UART0_RTsb/SMC0_D05 and PD_06/SPI1_SEL7b/C1_FLG3/ UART0_CTSb/SMC0_D06	U26	Low
2	UART0_EN	Enables UART0	U27	PF_08/UART0_TXb and PF_09/UART0_RXb	U26	Low
3	NOT USED					
4	NOT USED					
5	MLB3_EN	Enables MLB3		None	J13	High
6	CAN0_EN	Enables CAN0	U5	CAN0 signals	U36	High
7	CAN1_EN	Enables CAN1	U5	CAN1 signals	U36	High

Table 3-5: Output Signals of Microchip GPIO Expander (U47 Port B)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Connected	Default
0	ADAU1962	Enables ADAU1962	U6	DAI0_PIN02, DAI0_PIN04, DAI0_PIN01 and DAI0_PIN05	U38	High
1	ADAU1979_EN	Enables ADAU1979	U7	DAI0_PIN20, DAI0_PIN12, DAI0_PIN06 and DAI0_PIN07	U42	High
2	AUDIO_JACK_SEL	Selects between connector being configured for input or output	U40	None	J3	High
3	SD_WP_EN	SD Card WP	U11	PC_13/CAN0_TX/ MSI0_INTb/UART2_RXb/ SMC0_A08	U3	Low
4	SPI2FLASH_CS_EN	SPI2 FLASH CS	U44	PB_15/SPI2_SEL1b	U3	Low
5	SPI2D2_D3_EN	Enables Quad mode for SPI2 Flash	U45 and U60	PB_12/SPI2_D2 and PB_13/ SPI2_D3	U3	Low
6	SPDIF_OPTICAL	Enables S/PDIF optical connectors	U15 and U18	DAI0_PIN19, DAI0_PIN20	J1 and J10	Low
7	SPDIF_DIGITAL_EN	Enables S/PDIF digital connectors	U16 and U17	DAI0_PIN19, DAI0_PIN20	J12	High

Tables *Output Signals of Microchip GPIO Expander (U48 Port A)* and *Signals of Microchip GPIO Expander (U48 Port B)* show the output signals of the Microchip GPIO expander (U48), with a TWI address of 0100 010X, where X represents the read or write bit. The signals that control an individual FET have an entry in the *FET* column. The *Component Connected* column shows the board IC that is connected if the FET is enabled. However, in most cases, the Microchip (U48) is controlling the enable signal of a FET switch. Also note that if a particular functionality of the processor signal is being used, it is in *bold* font in the *Processor Signal* column.

**Table 3-6:** Output Signals of Microchip GPIO Expander (U48 Port A)

<i>Bit</i>	<i>Signal Name</i>	<i>Description</i>	<i>FET</i>	<i>Processor Signal</i> <i>(if applicable)</i>	<i>Connected</i>	<i>Default</i>
0	$\overline{\text{PUSHBUTTON3\_EN}}$	PC_10 is used as GPIO input for push button 3, enabled by default	U19	PC_10/SPI1_SEL1b/ SMC0_ARDY/SPI1_SSb	SW9	Low
1	$\overline{\text{PUSHBUTTON2\_EN}}$	PC_09 is used as GPIO input for push button 2, enabled by default	U23	PC_09/SPI1_MOSI/ SMC0_AMS3b	SW3	Low
2	$\overline{\text{PUSHBUTTON1\_EN}}$	PC_08 is used as GPIO input for push button 1, enabled by default	U22	PC_08/SPI1_MISO/PPI0_D14/ SMC0_AMS2b	SW4	Low
3	$\overline{\text{LEDS\_EN}}$	Px is used as GPIO output for LED10-17, enabled by default	U8	PE_13, PA_09, PE_01, PC_14, PC_04, PF_11, PD_06, PE_15	LED10- 17	Low
4	$\overline{\text{FLG0\_LOOP}}$	Connects 2 LEDs together, disabled by default	U21	PE_13 and PF11	LED10- 11	High
5	$\overline{\text{FLG1\_LOOP}}$	Connects 2 LEDs together, disabled by default	U61	PE_01 and PC_14	LED12- 13	High
6	$\overline{\text{FLG2\_LOOP}}$	Connects 2 LEDs together, disabled by default	U62	PC_04 and PA_09	LED14- 15	High
7	$\overline{\text{FLG3\_LOOP}}$	Connects 2 LEDs together, disabled by default	U64	PD_06 and PE_15	LED16- 17	High

**Table 3-7:** Output Signals of Microchip GPIO Expander (U48 Port B)

<i>Bit</i>	<i>Signal Name</i>	<i>Description</i>	<i>FET</i>	<i>Processor Signal</i> <i>(if applicable)</i>	<i>Connected</i>	<i>Default</i>
0	$\overline{\text{ADAU1977\_EN}}$	Enables ADAU1977	U7	DAI0_PIN20, DAI0_PIN12, DAI0_PIN06 and DAI0_PIN07	U42	High
1	$\overline{\text{ADAU1977\_FAULT\_RST\_EN}}$	Enables ADAU1977 FAULT and RESET	U7	PD_01/GPIO/SMC0_D01 and PD_00/GPIO/SMC0_D00	U42	High



Table 3-7: Output Signals of Microchip GPIO Expander (U48 Port B) (Continued)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Connected	Default
2	THUMBWHEEL_ OE	Enables thumbwheel switch	U28	PE_13/MSI0_D1/C1_FLG0/ CNT0_UD, PD_08/ ETH0_PTP0PPS1/CNT0_DG/ SPI2_SEL4b/SMC0_D08 and PD_07/SPI1_SEL6b/ CNT0_ZM/TM0_TMR7/ SMC0_D07	SW5	High
3	ENGINE_RPM_ OE	PE_09 is used as an input for engine RPM, disabled by default	U52	PA_00/SMC0_A01	P12	High
4	AD2410_ MASTER_SLAVE	Selects between master (low) and slave (high)			U10	High
5	LINK_PORT_ ISOLATE	Disconnects LP1_D6 from going to other areas of the board.	U12	PA_09/ETH0_PTP0PPS0/ LP1_D6/SPI0_SEL4b/ SMC0_A09	J9	Low
6	NOT USED					
7	NOT USED					

## Switches

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

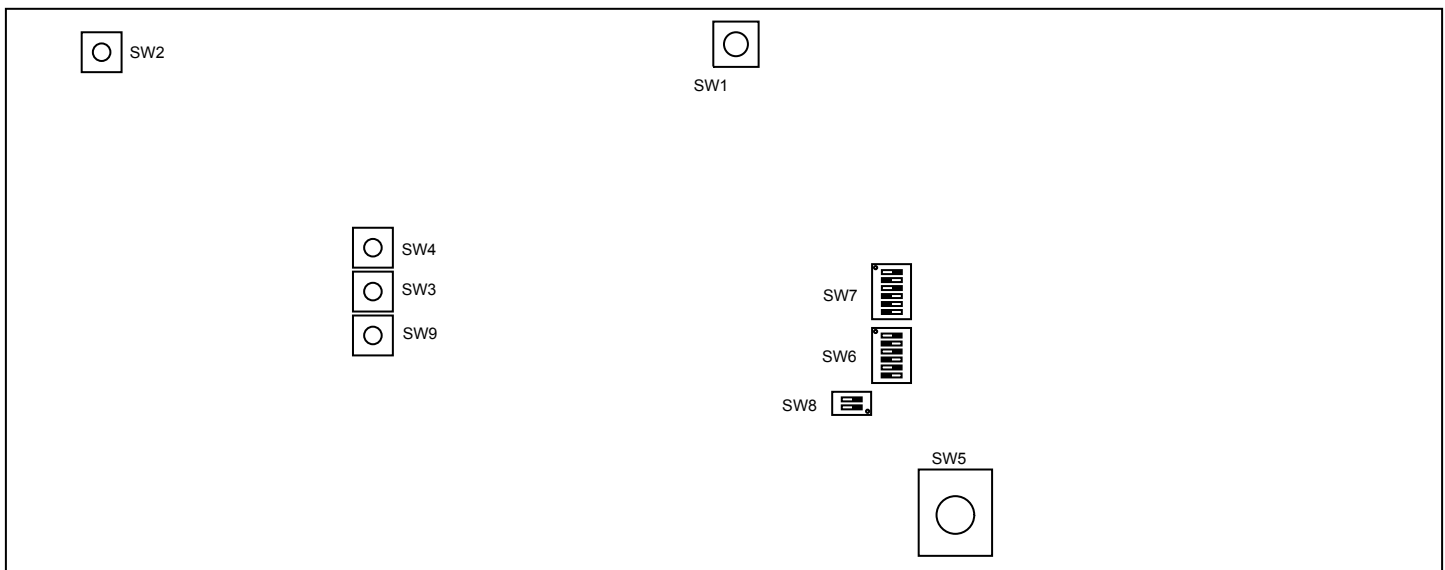


Figure 3-6: Switch Locations

## Boot Mode Select ( sw1 )

The Boot Mode selection switch selects between the different boot modes of the processor. The *Boot Mode Switch* table shows the available boot mode settings. By default, the processor boots from SPI2 master boot which uses the on-board SPI flash memory.

Table 3-8: Boot Mode Switch

<i>Position</i>	<i>Processor Boot Mode</i>
0	No boot
1	<i>SPI2 master boot</i>
2	SPI2 slave boot
3	UART0 slave boot
4	Reserved
5	Reserved
6	Link Port 0 slave boot
7	Reserved

## Reset Pushbutton ( sw2 )

The reset pushbutton resets the ADSP-SC573 processor. The reset signal also is connected to the expansion connectors via the `SYS_HWRST` signal. [Reset \( LED22 \)](#) is used to indicate when the board is in reset.

## GPIO Pushbuttons ( sw4 , sw3 and sw9 )

The GPIO pushbuttons are connected to the processor's signals `PC_08/SPI1_MISO/PPI0_D14/SMC0_AMS2b`, `PC_09/SPI1_MOSI/SMC0_AMS3b` and `PC_10/SPI1_SEL1b/SMC0_ARDY/SPI1_SSb`, respectively.

The GPIO pushbuttons can be disconnected from the processor by setting SoftConfig, see [Software-Controlled Switches \(SoftConfig\)](#) for more information.

## Rotary Encoder ( sw5 )

The rotary encoder can be turned clockwise for an up count or counter-clockwise for a down count. The encoder also features a momentary switch, activated by pushing the switch towards the center of the board, that can be used to set the counter to zero. The rotary encoder is a two-bit quadrature (Gray code) encoder.

The rotary encoder can be disconnected from the processor by setting SoftConfig, see [Software-Controlled Switches \(SoftConfig\)](#) for more information.

## CAN Wake ( sw8 )

The CAN Wake switch provides a high or low rising edge signal to the WAKE pin on each of the CAN transceivers. This will change the state of the transceiver from sleep to normal mode.

## JTAG Interface ( SW6 and SW7 )

The JTAG Interface switches select between a single processor (one board) and multiprocessor (more than one board) configurations. By default, the switches are set up for a single EZ-KIT configuration.

**Table 3-9:** Single Processor Configuration

Location	Position
SW6.1	ON
SW6.2	OFF
SW6.3	ON
SW6.4	OFF
SW6.5	ON
SW6.6	OFF
SW7.1	ON
SW7.2	OFF
SW7.3	ON
SW7.4	OFF
SW7.5	OFF
SW7.6	OFF

To use an emulator and multiple EZ-KITs simultaneously set up the boards as shown below. Attach the boards to each other through connectors J8 and J9 . Connect using the Samtec cables described in [Link Port/JTAG \( J8 and J9 \)](#).

**Table 3-10:** Multiple Processor Configuration

Location	EZ-KIT connected to emulator	EZ-KIT not connected to emulator
SW6.1	ON	OFF
SW6.2	ON	ON
SW6.3	ON	OFF
SW6.4	ON	ON
SW6.5	ON	OFF
SW6.6	ON	ON
SW7.1	ON	OFF
SW7.2	ON	OFF
SW7.3	ON	OFF
SW7.4	OFF	ON

Table 3-10: Multiple Processor Configuration (Continued)

Location	EZ-KIT connected to emulator	EZ-KIT not connected to emulator
SW7.5	OFF	ON
SW7.6	ON	OFF

## Jumpers

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

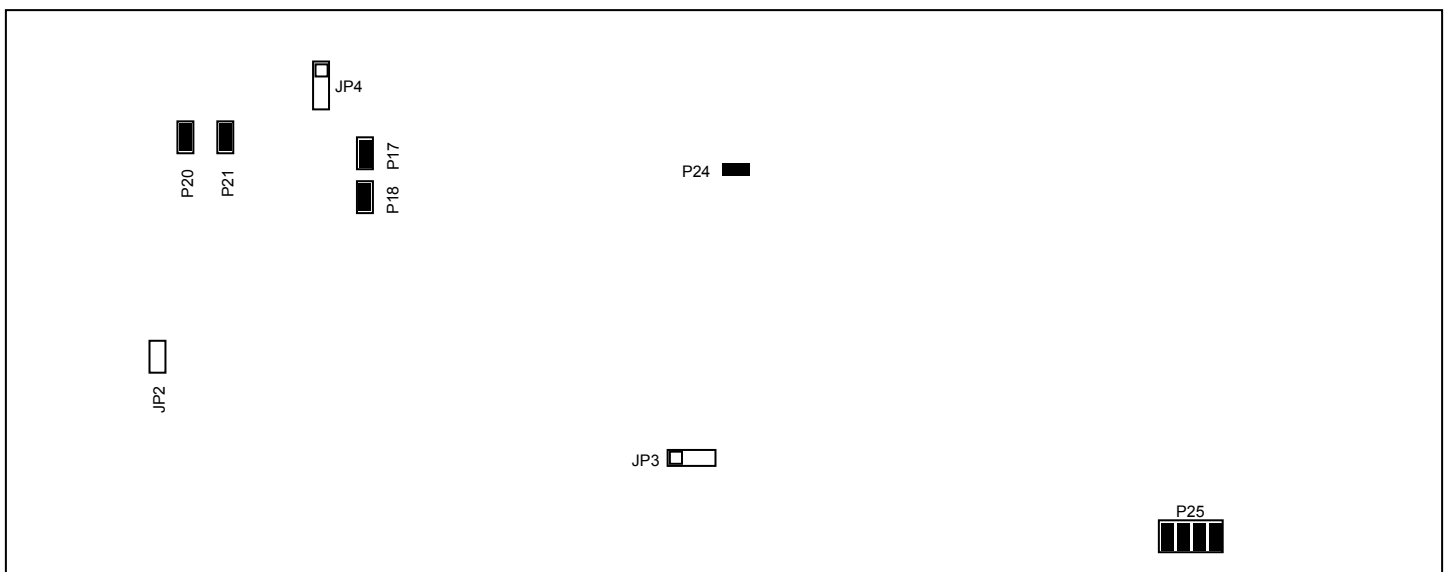


Figure 3-7: Jumper Locations

### S/PDIF Loopback ( JP2 )

The S/PDIF loopback jumper is used to connect the S/PDIF input and output signals together and bypass the two RCA connectors.

### CAN INH ( JP3 )

The CAN INH jumper is used to connect the inhibit output signal from the CAN transceiver to drive the enable/disable signal to the voltage regulator that powers the boards.

Table 3-11: CAN INH Jumper

Installed Jumper	Driver
1 and 2	TJA1055
2 and 3	TJA1145

## Regulator Disable ( JP4 )

The Regulator disable jumper is used to allow either the CAN transceiver or the A<sup>2</sup>B interface to drive the enable/disable signal to the voltage regulator that powers the boards.

Table 3-12: Regulator Disable Jumper

Installed Jumper	Driver
1 and 2	CAN
2 and 3	A <sup>2</sup> B

## Current Measurement ( P17, P18, P20, P21 and P24 )

The current measurement jumpers are used to measure the current draw of the VDD\_INT, 1.5V, 3.3V, VDD\_EXT and USB0\_VBUS respectively. The default is for the jumpers to be installed. To measure the current draw, remove the jumper and measure the voltage across the precision resistor. The current can be calculated by dividing the measured voltage by the 0.051 ohm resistor. For best results a differential probe should be used to measure the voltage across the resistor.

## HADC ( P25 )

The HADC jumper is used to connect the HADC of the processor to various voltages on the board for monitoring.

Jumper	Voltage
1 and 2	3.3V
3 and 4	1.8V
5 and 6	VDD_INT
7 and 8	12V

## LEDs

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

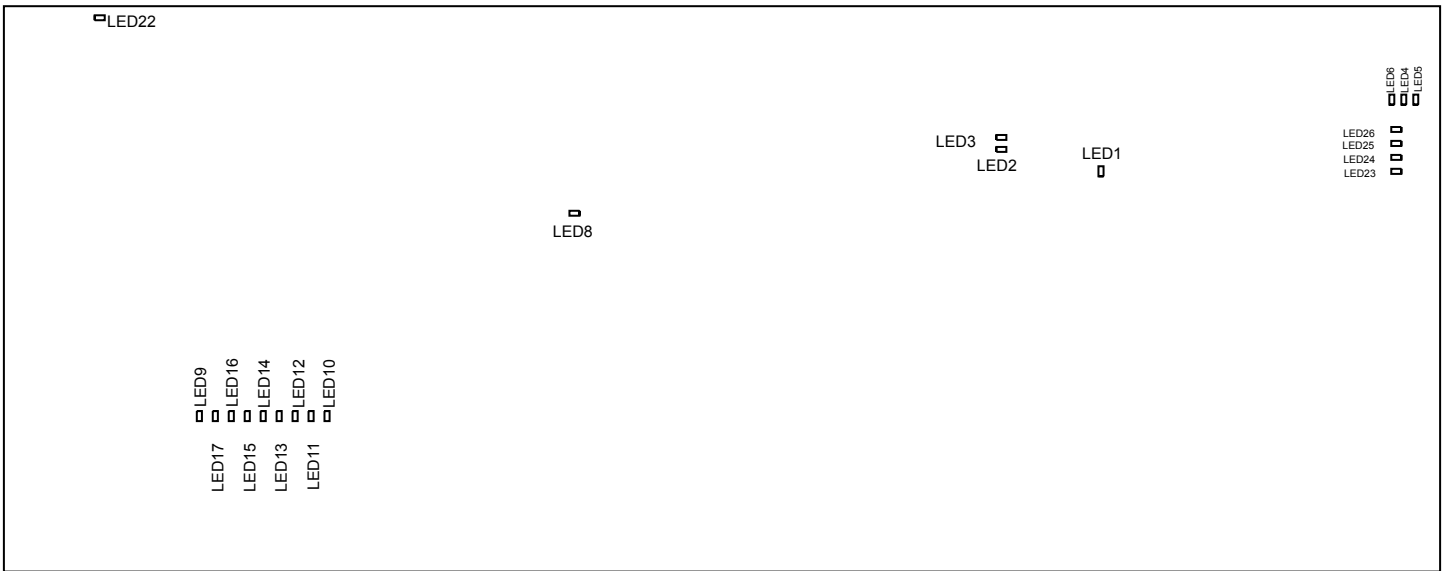


Figure 3-8: LED Locations

### Fault ( LED1 )

When ON, it indicates a system fault. For more information, refer to the ADSP-SC57xHardware Reference Manual.

### USB to UART Activity ( LED2-3 )

The USB to UART activity LEDs are used to indicate the transmitting and receiving of data between a PC and the [USB to UART \(FT232R\)](#).

Table 3-13: USB to UART LEDs

LED	Function
LED2	Receive
LED3	Transmit

### BCM89810 Status ( LED4-6 )

The BCM89810 status LEDs are used to indicate activity and the speed of the link that was established.

Table 3-14: BCM89810 Status LEDs

LED	Status
LED4	10M
LED5	100M

Table 3-14: BCM89810 Status LEDs (Continued)

LED	Status
LED6	Activity

## A<sup>2</sup>B Interrupt ( LED8 )

The A<sup>2</sup>B interrupt LED is driven by the AD2410 when it is configured as a master and driven by the SC573 when the AD2410 is configured as a slave.

## Power ( LED9 )

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

## GPIO ( LED10–17 )

Eight 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 turned ON (amber) by writing a 1 to the correct processor signal.

Table 3-15: GPIO LEDs

<i>Reference Designator</i>	<i>Programmable Flag Pin</i>
<i>LED10</i>	PE_13
<i>LED11</i>	PA_09
<i>LED12</i>	PE_01
<i>LED13</i>	PC_14
<i>LED14</i>	PC_04
<i>LED15</i>	PF_11
<i>LED16</i>	PD_06
<i>LED17</i>	PE_15

## Reset ( LED22 )

When ON (red), it indicates that the board is in reset. A master reset is asserted by pressing SW2 , which activates the LED. For more information, see [Reset Pushbutton \( SW2 \)](#).

## DP83865 Status ( LED23–26 )

The DP83865status LEDs are used to indicate activity and the speed of the link that was established.

Table 3-16: DP83865 Status LEDs

LED	Status
LED23	Activity
LED24	10M
LED25	100M
LED26	1000M

## Connectors

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

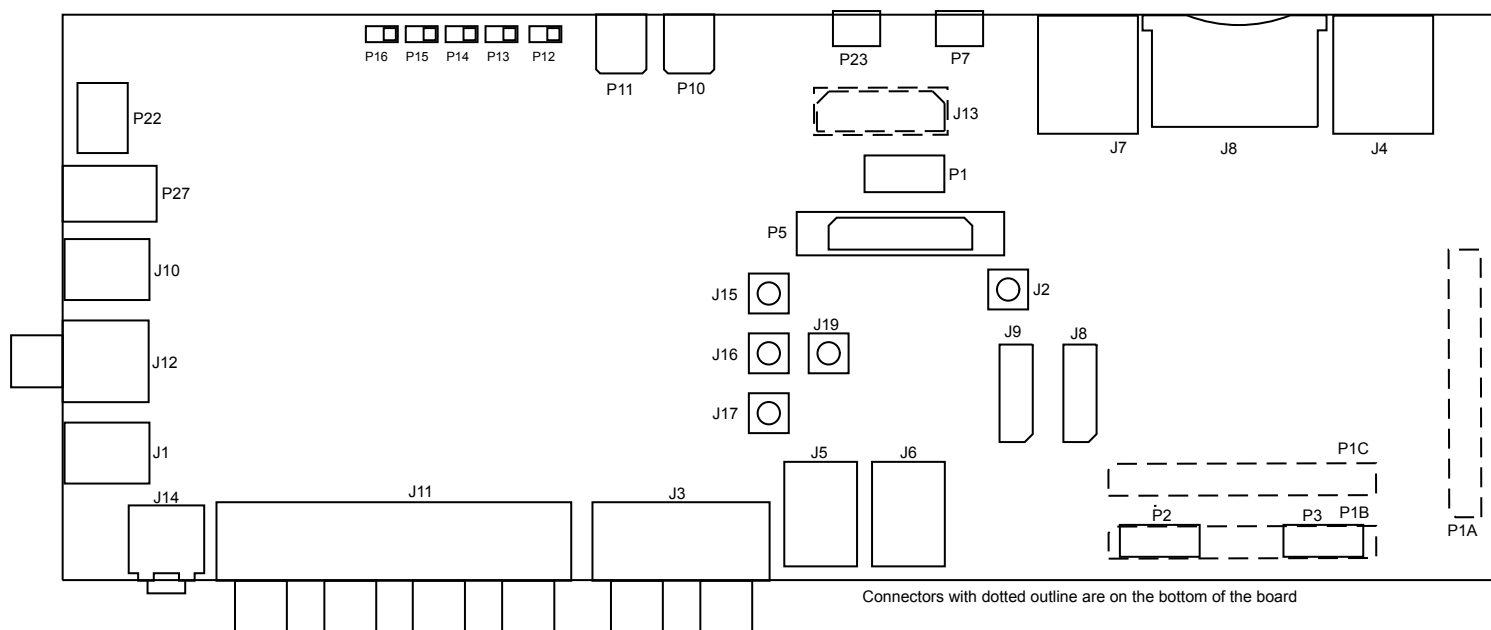


Figure 3-9: Connector Locations

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

### S/PDIF Optical Tx ( J1 )

Part Description	Manufacturer	Part Number
Fiber optic transmitter	Everlight	PLT133/T10W
<i>Mating Cable</i>		
Standard TOSLINK optical digital cable		



**Clock ( J2 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMB jack	Emerson	131-3711-201
<i>Mating Cable</i>		
Standard SMB cable		

**Audio Input/Output ( J3 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
RCA 2x2 female	Switchcraft	PJRAS2X2S
<i>Mating Cable</i>		
Standard audio cable with RCA connectors		

**Ethernet 10/100/1000 ( J4 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
RJ45	Assmann	A-2004-2-4-LPS-N-R
<i>Mating Cable</i>		
Standard CAT5e Ethernet cable		

**CAN ( J5 and J6 )**

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

**Ethernet 10/100 ( J7 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
RJ45	Assmann	A-2004-2-4-LPS-N-R
<i>Mating Cable</i>		
Standard CAT 5e Etherent cable		

**Link Port/JTAG ( J8 and J9 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
ERF8 10X2, female	Samtec	ERF8-010-05.0-D-DV-L
<i>Mating Cable</i>		
6" coax cable assembly	Samtec	ERCD-010-06.00-TED-TEU-1-D

## S/PDIF Optical Rx ( J10 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
Fiber optic receiver	Everlight	PLR135/T10
<i>Mating Cable</i>		
Standard TOSLINK optical digital cable		

## Audio Output ( J11 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
RCA 4x2 female	Switchcraft	PJRAS4X2U
<i>Mating Cable</i>		
Standard audio cable with RCA connectors		

## S/PDIF Digital ( J12 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
RCA 1x2 female	Switchcraft	PJRAS1X2S02X
<i>Mating Cable</i>		
Standard S/PDIF cable with RCA connectors		

## MLB ( J13 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
40-pin high speed socket	Samtec	QSH-020-01-L-D-DP-A
<i>Mating Connector</i>		
40-pin high speed header	Samtec	QTH-0202-01-L-D-DP-A

## Headphone ( J14 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
3.5mm headphone connector	CUI	SJ1-3525NG
<i>Mating Cable</i>		
Standard audio cable with 3.5mm connector		

## HADC ( J15-J17 and J19 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
SMB jack	Emerson	131-3711-201
<i>Mating Cable</i>		
Standard SMB cable		

## JTAG ( P1 )

The JTAG header provides debug connectivity for the processor. This is a 0.05" shrouded through-hole connector from SAMTEC (SHF-105-01-L-D-SM-K). This connector mates with ICE- 1000, ICE-2000, and any newer Analog Devices emulators. For more information, see [Debug Interface](#)

## Sigma Studio ( P2 )

This connector interfaces with SigmaStudio through the EVAL-ADUSB2EBZ board. The connector is a 0.1" header. The pinout can be found in the schematic.

## TWI0 and SPI2 ( P3 )

Use to connect with TWI0 and SPI2 signals for external use. The connector is a 0.1" header. The pinout can be found in the schematic.

## Trace and JTAG ( P5 )

The Trace and JTAG connector provides connectivity to the processor's trace interface. This is a MICTOR connector from TYCO (2-5767004-2). At this time, there are no trace pods available.

## USB to UART( P7 )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
USB Micro-AB	Hirose	ZX62D-AB-5P8
<i>Mating Cable</i>		
USB Micro-B to Standard-A cable		

**A<sup>2</sup>B ( P10 and P11 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
2-pin DuraClik	Molex	5023520200
<i>Mating Cable</i>		
DuraClik cable assembly		

**Engine RPM ( P12 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
IDC 2x1 0.1"	Samtec	HTSW-102-07-T-S
<i>Mating Cable</i>		
Custom cable assembly		

**Microphone ( P13-P16 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
IDC 2x1 0.1"	Samtec	HTSW-102-07-T-S
<i>Mating Cable</i>		
Custom cable assembly		

**Power Plug ( P22 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
2.1 mm power jack	CUI	PJ-102AH
<i>Mating Cable</i>		
12.0VDC@1.5A power supply	CUI	EMSA120150-P5RP-SZ

**USB ( P23 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
USB Micro-AB	Hirose	ZX62D-AB-5P8
<i>Mating Cable</i>		
USB Micro-B to Standard-A or Micro-A to Standard-A receptacle cable		

**Power Terminal Block ( P27 )**

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
5.08mm power jack	Weidmuller	1760510000
<i>Mating Cable</i>		
12.0VDC discrete wires		

### Expansion Interface 3 ( P1A, P1B and P1C )

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
120-pin, 0.6 mm	Hirose	FX8-120P-SV1(91)
<i>Mating Connector</i>		
120-pin, 0.6 mm	Hirose	FX8-120S-SV(21)