ADSP-CM408F EZ-KIT Lite®
Evaluation System Manual

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ANALOG DEVICES

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The ADSP-CM408F EZ-KIT Lite is designed to be used solely in a laboratory environment. The board is not intended for use as a consumer end product or as a portion of a consumer end product. The board is an open system design which does not include a shielded enclosure and therefore may cause interference to other electrical devices in close proximity. This board should not be used in or near any medical equipment or RF devices.

The ADSP-CM408F EZ-KIT Lite is in the process of being certified to comply with the essential requirements of the European EMC directive 2004/108/EC and therefore carries the "**CE**" mark.

CE

The EZ-KIT Lite evaluation system contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused EZ-KIT Lite boards in the protective shipping package.

CONTENTS

PREFACE

Product Overview x
Purpose of This Manual xiv
Intended Audience xiv
Manual Contents xv
What's New in This Manual xv
Technical Support xvi
Supported Processors xvi
Supported Tools xvii
Product Information xvii
Analog Devices Web Site xvii
EngineerZone xviii
Notation Conventions xviii

USING ADSP-CM408F EZ-KIT LITE

Package Contents 1-2
ADSP-CM408F EZ-Board 1-3
Default Configuration 1-3
IAR Embedded WorkBench and Board Installation 1-5

Contents

IAR Embedded WorkBench Session Startup 1-6
SRAM Memory (U2) 1-8
SPI Flash 1-8
Analog Interface 1-8
UART0 Interface (RS-232) 1-9
UART1 Interface (RS-485) 1-10
CAN0 Interface 1-11
CAN1 Interface 1-11
USB OTG FS Interface 1-12
Ethernet Interface 1-12
Debug Interface 1-13
Serial Liquid Crystal Display Module Interface 1-13
Power-On-Self Test 1-14
Expansion Interface 1-14
Power Architecture 1-15
Power Measurements 1-15
Example Programs 1-16
Reference Design Information 1-16

ADSP-CM408F EZ-KIT LITE HARDWARE REFERENCE

System Architecture 2-2
Software-Controlled Switches (SoftConfig) 2-3
Overview of SoftConfig 2-3
SoftConfig on the ADSP-CM408F EZ-KIT LITE 2-7
Programming SoftConfig Switches 2-8
Push Buttons and Switches 2-15
Boot Mode Select Switch (SW1) 2-16
Reset Push Button (SW2) 2-16
GPIO Push Buttons (SW4-5) 2-16
Wake Push Button (SW3) 2-17
Jumpers 2-17
VREF1 External Source Jumper (JP1) 2-18
Power Select Jumper (JP2) 2-18
Buffer Input Select Jumper (JP3) 2-18
VREF0 External Source Jumper (JP4) 2-19
Power Jumpers (P4-7) 2-19
LEDs 2-20
GPIO LEDs (LED1–4) 2-21
Reset LED (LED5) 2-21
Ethernet Speed LED (LED6) 2-21
Power LED (LED7) 2-22
SYS_FAULT LED (LED8) 2-22

Contents

Connectors 2-23
Ethernet Connector (J1) 2-24
RS-485 Connector (J2) 2-24
DCE UART Connector (J3) 2-24
Asynch or Memory Connector (J4) 2-24
Character Display Connector (J5) 2-25
PWM Connector (J6) 2-25
CAN0 Connector (J7) 2-25
CAN1 Connector (J8) 2-26
Analog Connector (J9) 2-26
JTAG/SWD Connector (P1) 2-26
TRACE and JTAG/SWD/SWV Connector (P2) 2-26
USB Connector (P3) 2-27
IEEE 1588 Connector (P8) 2-27
Power Connector (P9) 2-27
VREF Buffered Connector (P10) 2-27

ADSP-CM408F EZ-KIT LITE BILL OF MATERIALS

ADSP-CM408F EZ-KIT LITE SCHEMATIC

INDEX

PREFACE

Thank you for purchasing the ADSP-CM408F EZ-KIT Lite®, Analog Devices, Inc. low-cost evaluation system for the ADSP-CM408F mixed-signal control processor.

The ADSP-CM408F processor is based on the ARM® Cortex®-M4 processor core and is designed for motor control and industrial applications. The EZ-KIT Lite is shipped with all of the necessary hardware—you can start the evaluation immediately. The package contains the standalone evaluation board, CE-approved power supply, and USB cable. The EZ-KIT Lite version ships with the J-Link Lite ARM, while the EZ-Board® version requires the customer to provide an emulator.

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

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

The evaluation board is designed to be used in conjunction with the IAR Embedded Workbench development tools to test capabilities of the ADSP-CM408F processors. The development environment aids advanced application code development and debug, such as:

- Create, compile, assemble, and link application programs written in C++, C, and assembly
- Load, run, step, halt, and set breakpoints in application programs
- Read and write data and program memory
- Read and write core and peripheral registers

Product Overview

The board features:

- Analog Devices ADSP-CM408F processor
    - 176-pin LQFP package
    - 30 MHz CLKIN core oscillator
- SRAM memory (SMC0) chip
    - 256K x 16-bit (4M bit)
    - Cypress CY7C1041DV33
- Ethernet PHY (ETH0)
    - 10/100 Mb/s
    - Texas Instruments DP83848C

- Universal Asynchronous Receiver/Transmitter (UART0)
    - Analog Devices ADM3252E RS-232 line transceiver
    - DB9 female connector
- Universal Asynchronous Receiver/Transmitter (UART1)
    - Analog Devices ADM2682E RS-485 line transceiver
    - DB9 female connector
- Controller Area Network (CAN) interfaces
    - CAN0—Analog Devices ADM3053 transceiver and RJ11 connector
    - CAN1—Analog Devices ADM3053 transceiver and RJ11 connector
- USB interface
    - Molex 56579-0576 connector
- Display
    - New Haven NHD-0220D3Z-FL-GBW
    - 2 x 20 character
    - 2-wire interface (TWI) control
- RESET controller
    - Analog Devices ADM708 microprocessor supervisory circuits
- Debug (JTAG/SWD/SWV/TRACE) interface
    - JTAG/SWD 20-pin 0.1” header for use with IAR emulators
    - Trace/JTAG/SWD/SWV 20-pin 0.05” header

- LEDs
    - Eight LEDs: one power (green), one board reset (red), one Ethernet speed (green), one SYS_FAULT (red), and four general-purpose (amber)
- Push buttons
    - Four push buttons: one reset, one wake, two IRQ/Flag
- Asynchronous connector
    - 180-pin Samtec (QSH-090-01-F-D-A) 0.5 mm spacing
    - SMC0 address, data, and control
    - CLKOUT
    - SPI1
    - UART2
    - TWI0
    - GPIOs
    - RESET
    - GND/3.3V/5V output
- Pulse-width modulation (PWM) connector
    - 180-pin Samtec (QSH-090-01-F-D-A) 0.5 mm spacing
    - PWM0—PWM2
    - SINC0
    - SPI1
    - SPT0
    - TWI0

    - TMR0
    - CNT0—CNT3
    - GPIO
    - RESET
    - GND/3.3V/5V output
    - 5V output
- Analog connector interface
    - 120-pin Samtec (QSH-060-01-F-D-A) 0.5 mm spacing
    - ADC0
    - AGND/GND/VREF/5VOUT
    - ADR441 voltage reference (VREF)
    - ADA4899 buffer—0.1” header for reference
- 1588 connector
    - 0.1” header 6-pin
- External power supply
    - CE compliant
    - 5V @ 3.6 Amps
    - Ability to power from the PWM connector
- Other features
    - 0.05-ohm resistors for processor current measurement

For information about the hardware components of the EZ-KIT Lite, refer to ADSP-CM408F EZ-KIT Lite Bill Of Materials.

Purpose of This Manual

The *ADSP-CM408F EZ-KIT Lite Evaluation System Manual* provides instructions for installing the product hardware (board). The text describes operation and configuration of the board components and provides guidelines for running your own code on the ADSP-CM408F EZ-KIT Lite. Finally, a schematic and a bill of materials are provided for reference.

Intended Audience

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

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

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

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

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

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

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

Manual Contents

The manual consists of:

- Chapter 1, Using ADSP-CM408F EZ-KIT Lite
  Describes EZ-KIT Lite functionality from a programmer's perspective and provides a simplified memory map of the processor.
- Chapter 2, ADSP-CM408F EZ-KIT Lite Hardware Reference
  Provides information about the EZ-KIT Lite hardware components.
- Appendix A, ADSP-CM408F EZ-KIT Lite Bill Of Materials
  Provides a list of hardware components used to manufacture the EZ-KIT Lite board.
- Appendix B, ADSP-CM408F EZ-KIT Lite Schematic
  Lists the resources for board-level debugging.

What's New in This Manual

This is Revision 1.1 of the *ADSP-CM408F EZ-KIT Lite Evaluation System Manual*. Changes from Revision 1.0 include an updated Bill of Materials and an updated schematic.

Technical Support

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

- Post your questions in the processors and DSP support community at EngineerZone®:
  http://ez.analog.com/community/dsp
- Submit your questions to technical support directly at:
  http://www.analog.com/support
- E-mail your questions about processors and processor applications to:
  processor.support@analog.com or
  processor.china@analog.com (Greater China support)
- In the **USA only**, call **1-800-ANALOGD** (1-800-262-5643)
- Contact your Analog Devices sales office or authorized distributor. Locate one at:
  www.analog.com/adi-sales
- Send questions by mail to:
  Processors and DSP Technical Support
  Analog Devices, Inc.
  Three Technology Way
  P.O. Box 9106
  Norwood, MA 02062-9106
  USA

Supported Processors

This evaluation system supports Analog Devices ADSP-CM408F processors.

Supported Tools

Information on supported tools for the ADSP-CM408F EZ-KIT Lite and the ADSP-CM40x family of mixed-signal control processors is available at:

http://www.analog.com/CM408FEZKit

Product Information

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

Analog Devices Web Site

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

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

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

Visit myAnalog.com (found on the Analog Devices home page) to sign up. If you are a registered user, just log on. Your user name is your e-mail address.

EngineerZone

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

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

Notation Conventions

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

Example	Description
File > Close	Titles in reference sections indicate the location of an item within the CCES environment's menu system (for example, the **Close** command appears on the **File** menu).
{this | that}	Alternative required items in syntax descriptions appear within curly brackets and separated by vertical bars; read the example as this or that. One or the other is required.
[this | that]	Optional items in syntax descriptions appear within brackets and separated by vertical bars; read the example as an optional this or that.
[this,…]	Optional item lists in syntax descriptions appear within brackets delimited by commas and terminated with an ellipse; read the example as an optional comma-separated list of this.

Example	Description
.SECTION	Commands, directives, keywords, and feature names are in text with `letter gothic` font.
filename	Non-keyword placeholders appear in text with italic style format.
	Note: For correct operation, ... A Note provides supplementary information on a related topic. In the online version of this book, the word **Note** appears instead of this symbol.
	Caution: Incorrect device operation may result if ... **Caution:** Device damage may result if ... A Caution identifies conditions or inappropriate usage of the product that could lead to undesirable results or product damage. In the online version of this book, the word **Caution** appears instead of this symbol.
	Warning: Injury to device users may result if ... A Warning identifies conditions or inappropriate usage of the product that could lead to conditions that are potentially hazardous for the devices users. In the online version of this book, the word **Warning** appears instead of this symbol.

Notation Conventions

1 USING ADSP-CM408F EZ-KIT LITE

This chapter provides information to assist you with development of programs for the ADSP-CM408F EZ-KIT Lite evaluation system.

The following topics are covered.

- Package Contents
- ADSP-CM408F EZ-Board
- Default Configuration
- IAR Embedded WorkBench and Board Installation
- IAR Embedded WorkBench Session Startup
- SRAM Memory (U2)
- SPI Flash
- Analog Interface
- UART0 Interface (RS-232)
- UART1 Interface (RS-485)
- CAN0 Interface
- CAN1 Interface
- USB OTG FS Interface
- Ethernet Interface

- Debug Interface
- Serial Liquid Crystal Display Module Interface
- Power-On-Self Test
- Expansion Interface
- Power Architecture
- Power Measurements
- Example Programs
- Reference Design Information

Package Contents

Your ADSP-CM408F EZ-KIT Lite package contains the following items.

- ADSP-CM408F EZ-KIT Lite board
- Universal 5V DC power
- USB 2.0 cable
- J-Link Lite ARM (only in the EZ-KIT Lite version)

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

ADSP-CM408F EZ-Board

The ADSP-CM408F EZ-KIT Lite is shipped with the J-Link Lite ARM debugger. When the product is not shipped with the debugger, it is referred to as the ADSP-CM408F EZ-Board.

The EZ-Board requires a third party emulator.

Default Configuration

The ADSP-CM408F EZ-KIT Lite board is designed to run as a stand-alone unit.

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

The EZ-KIT Lite evaluation system contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused EZ-KIT Lite boards in the protective shipping package.

Default Configuration

Figure 1-1 shows the default jumper settings, connector locations, and LEDs used in installation. Confirm that your board is in the default configuration before using the board.

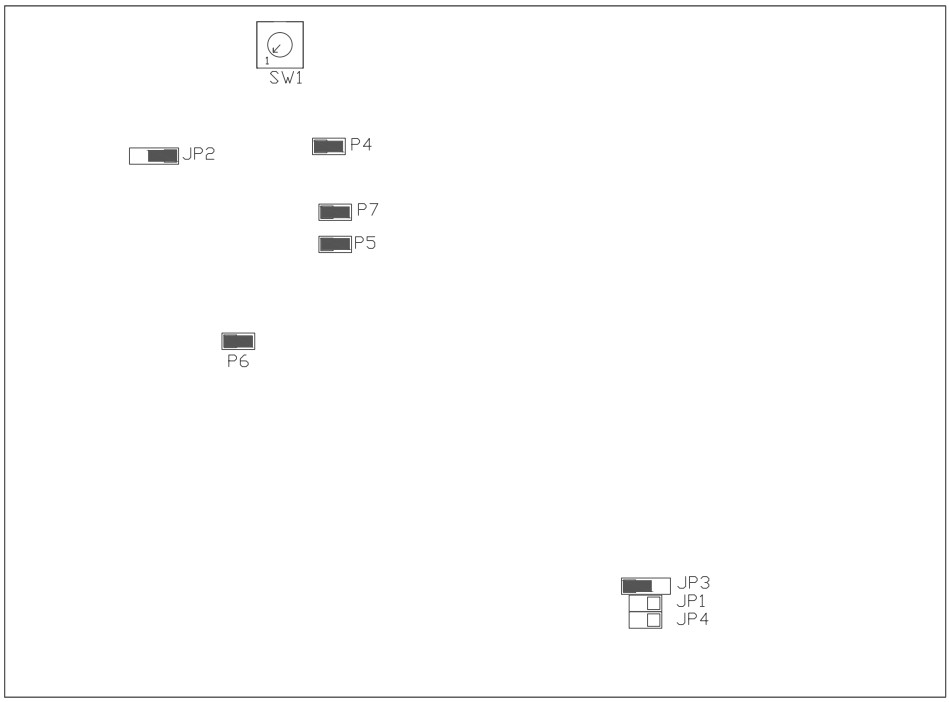


Figure 1-1. Default EZ-KIT Lite Hardware Setup

IAR Embedded WorkBench and Board Installation

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

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

The ADSP-CM408F EZ-KIT Lite software, based on the IAR Embedded WorkBench, can be found at:

http://www.analog.com/CM408FEZKit

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

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

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

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

1. Plug the jack-end of the power adaptor into the power connector P9 (labeled 5V) on the EZ-KIT Lite board.
2. Plug the other side of the power adaptor into a power outlet. The power LED (labeled LED7) is lit green when power is applied to the board.

IAR Embedded WorkBench Session Startup

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.

   Note that IAR Embedded WorkBench is not connected to the target board.

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 **AnalogDevices ADSP-CM40z-X_Y**, where **X** is the SRAM size in KB and **Y** is the internal flash size in KB of the part on the target board.

   On the Analog Devices ADSP-CM408F EZ-KIT Lite, SRAM size is 384 KB, and internal flash size is 2048 KB.

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 **JTAG** or **SWD**.

7. Click **OK** to save the emulator settings.
8. Choose **Project > Debug and Download** to download the project and start debugging.

SRAM Memory (U2)

The ADSP-CM408F processor is connected to a 4 Mb Cypress asynchronous SRAM device (CY7C1041DV33). The upper and lower halves of the 16-bit-wide data bus are connected to SoftConfig circuitry, which disconnects the expansion interface. The connection to the expansion interface is OFF by default.

Byte-enable signals ABE0 and ABE1 on the processor's pins PE_12 and PE_13 (respectively) are not connected by default; can be connected via SoftConfig.

For more information, refer to the SRAM example in the POST, which is included in the ADSP-CM40x Enablement Software.

SPI Flash

The EZ-KIT Lite ships with an internal 4 MB SPI flash, connected via the SPI2 interface, which is used for booting and scratchpad space. Refer to the *ADSP-CM40x Mixed-Signal Control Processor Hardware Reference* for more information about the internal SPI flash.

For more information, refer to the SPI flash example in the POST, which is included in the ADSP-CM40x Enablement Software.

Analog Interface

The ADSP-CM408F processor provides two 16-bit ADCs with 8 inputs each, ADC0 and ADC1. The ADC signals are connected to the Analog expansion connector (J9). Refer to ADSP-CM408F EZ-KIT Lite Schematic for more information.

Voltage reference for the ADC channels can be supplied internally from the processor or externally by ADR441 ICs. U5 is the VREF0 supply

external source, and U47 is its VREF1 equivalent. To select the external source for either supply, place a jumper on JP1 or JP4. Refer to ADSP-CM408F EZ-KIT Lite Schematic for more information.

A buffered version of the voltage reference is available on J9 via a unity gain buffer ADA4889 (U33). By default, the internal VREF0 source is selected as the input to the buffer (JP3 positions 1 and 2). If the external voltage reference is desired, change the jumper to JP3 positions 2 and 3.

Voltage references for the analog inputs are configurable; refer to Jumpers for more information.

UART0 Interface (RS-232)

The ADSP-CM408F processor has three built-in universal asynchronous transmitters (UARTs). UART0 is connected to a RS-232 line transmitter. UART0 has full RS-232 functionality via the Analog Devices ADM3252E isolated line driver and receiver (U36).

The EZ-KIT Lite voltage isolation components are not intended for protecting external products. The isolated ICs are used to showcase Analog Devices product portfolio only. Adequate voltage isolation of any external devices/boards is the user responsibility.

Pin PC_02/$\overline{\text{UART0_TX}}$/TRACE_D03/SPI0_RDY of the processor is connected to the ADM3315 device directly and used for UART transmit.

Pin PC_01/$\overline{\text{UART0_RX}}$/SMC0_A05/TM0_ACI5 is connected through SoftConfig by default and used for UART receive. (This can be changed using SoftConfig.)

By default, the UART0 CTS signal is not connected, and the UART0 RTS signal is connected to RS-232. Both connections can be changed through SoftConfig.

The SoftConfig switches also allow the loopback of CTS and RTS. The UART0 CTS can be added as an input to the reset circuit through SoftConfig. Refer to Software-Controlled Switches (SoftConfig) for more information.

For more information, refer to the UART0 example in the POST, which is included in the ADSP-CM40x Enablement Software. Note that the loopback of TX and RX data is done through an external connector.

UART1 Interface (RS-485)

UART1 is connected to a RS-485 line transmitter. UART1 has full RS-485 functionality via the Analog Devices ADM2682E isolated line driver and receiver (U39) that can transmit at 16 Mbps.

The EZ-KIT Lite is designed to be the end node in a network; therefore, it has a termination resistor (R44) installed with a value of 120 ohms. If the board is intended to be a middle node in the network, the resistor can be removed.

The EZ-KIT Lite voltage isolation components are not intended for protecting external products. The isolated ICs are used to showcase Analog Devices product portfolio only. Adequate voltage isolation of any external devices/boards is the user responsibility.

The UART1 transmit and receive signals are connected to the RS-485 transmitter directly from the processor. The ADM2682E device has driver enable and receiver enable signals, controlled by SoftConfig. The driver enable and receiver enable signals are disabled by default. Refer to Software-Controlled Switches (SoftConfig) for more information.

For more information, refer to the UART1 example in the POST, which is included in the ADSP-CM40x Enablement Software. Note that the loopback of the differential signals is done through an external connector.

CAN0 Interface

The Controller Area Network 0 (CAN0) interface of the EZ-KIT Lite is connected to the Analog Devices ADM3053 isolated CAN transceiver. The transceiver is attached to the CAN0 port of the ADSP-CM408F processor via an RJ-11 connector (J7). See CAN0 Connector (J7).

The EZ-KIT Lite voltage isolation components are not intended for protecting external products. The isolated ICs are used to showcase Analog Devices product portfolio only. Adequate voltage isolation of any external devices/boards is the user responsibility.

The CAN0 transmit and receive signals are connected through the SoftConfig switches and enabled by default. See Software-Controlled Switches (SoftConfig).

For more information, refer to the CAN0 example in the POST, which is included in the ADSP-CM40x Enablement Software.

CAN1 Interface

The Controller Area Network 1 (CAN1) interface of the EZ-KIT Lite is connected to the Analog Devices ADM3053 isolated CAN transceiver. The transceiver is attached to the CAN1 port of the ADSP-CM408F processor via an RJ-11 connector (J8). See CAN1 Connector (J8).

The EZ-KIT Lite voltage isolation components are not intended for protecting external products. The isolated ICs are used to showcase Analog Devices product portfolio only. Adequate voltage isolation of any external devices/boards is the user responsibility.

The CAN1 transmit and receive signals are connected through the SoftConfig switches and enabled by default. See Software-Controlled Switches (SoftConfig).

For more information, refer to the CAN1 example in the POST, which is included in the ADSP-CM40x Enablement Software.

USB OTG FS Interface

The ADSP-CM408F processor has an integrated USB PHY; the EZ-KIT Lite provides a mini AB connector. The board only supports USB full speed mode.

The board allows 5V at 500 mA to a peripheral device by enabling the FET switch (U44). The USB controller controls the FET switch through the USB_VBC signal.

To learn about the processor's device and host modes, refer to the USB example in the POST, which is included in the ADSP-CM40x Enablement Software. For more information, refer to the *ADSP-CM40x Mixed-Signal Control Processor Hardware Reference*.

Ethernet Interface

The ADSP-CM408F processor features a Reduced Media Independent Interface (RMII), which connects to an external Ethernet PHY device (ETH0). The EZ-KIT Lite provides a Texas Instruments DP83848C, Auto-MDIX, fully-compliant PHY with IEEE 802.2/802.2u standards.

The PHY supports 10BASE-T and 100BASE-TX operations and is connected to a standard RJ-45 connector (J1). The IEEE 1588 time stamping signals can be probed on connector P8. For more information, see Ethernet Connector (J1) and IEEE 1588 Connector (P8). Link and activity LEDs are integrated into the RJ45 connector. The speed indication LED (LED6) is located next to the RJ45 connector. See Ethernet Speed LED (LED6).

The MAC address is printed on the back of the EZ-KIT Lite board; the address must be set in software to use the Ethernet.

The Ethernet PHY device is disabled via SoftConfig. Refer to Software-Controlled Switches (SoftConfig) for more information.

For more information, refer to the ethernet example in the POST, which is included in the ADSP-CM40x Enablement Software.

Debug Interface

The EZ-KIT Lite provides a JTAG/SWD/SWV connection via a connector (P1), which is a 0.1" header. A 4-bit trace connection also is available via a connector (P2). See JTAG/SWD Connector (P1) and TRACE and JTAG/SWD/SWV Connector (P2) for more information.

Serial Liquid Crystal Display Module Interface

Connector J5 mates with the Newhaven Display International NHD-0220D3Z-FL-GBW-V3, a 2-line by 20-character display with a yellow/green backlight.

The display is written using the TWI interface. The TWI address of the display is 0x50. The maximum clock rate for the display is 100 kHz. The display can be removed if the frequency limitation poses a problem.

For more information, refer to the serial liquid crystal display example in the POST, which is included in the ADSP-CM40x Enablement Software.

Power-On-Self Test

The Power-On-Self-Test Program (POST) tests all EZ-KIT Lite peripherals and validates functionality as well as connectivity to the processor. Once assembled, each EZ-KIT Lite is fully tested for an extended period of time with POST. All EZ-KIT Lite 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 ADSP-CM40x Enablement Software along with the `readme.txt` file that describes how the board is configured to run POST.

Expansion Interface

The expansion interface allows a custom-design daughter board to be tested across various hardware platforms that have the same expansion interface.

The expansion interface implemented on the ADSP-CM408F EZ-KIT Lite consists of three connectors: Asynch or Memory Connector (J4), PWM Connector (J6), and Analog Connector (J9). The connectors contain a majority of the processor's signals. For pinout information, go to ADSP-CM408F EZ-KIT Lite Schematic.

Limits to current and interface speed must be taken into consideration when using the expansion interface. Current for extenders connected to `J4` or `J6` can be sourced from the EZ-KIT Lite; therefore, the current should be limited to 250 mA for 5V, and 200 mA from the 3.3V planes. If more current is required, a separate power connector and a regulator must be designed on the daughter card. Additional circuitry implemented on

extender cards can add extra loading to signals, decreasing their maximum effective speed.

Analog Devices does not support and is not responsible for the effects of additional circuitry.

Power Architecture

The ADSP-CM408F EZ-KIT Lite 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 JP2 to input from the PWM connector (J6) as an alternative to the wall power adaptor. Refer to PWM Connector (J6) and Power Select Jumper (JP2) for details.

The Analog Devices ADP2119 controller 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 ADP2119 (VR1) or a PNP transistor (Q1).

A FET switch (U44) controls the 5V to the USB devices over the USB_VBUS signal.

Power Measurements

Locations are provided for measuring the current draw from various power planes. Precision 0.05 ohm shunt resistors are available on the VDD_EXT, VDD_INT, USB_VBUS, and 3.3V and 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. For more information, refer to Power Jumpers (P4-7).

Example Programs

Example programs are provided with the ADSP-CM40x Enablement Software to demonstrate various capabilities of the product. The programs can be found in the `CM403F_CM408F_EZ-KIT\examples` 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 design, layout, fabrication, and assembly of the EZ-KIT Lite.

The information can be found at:

`http://www.analog.com/CM408FEZKit`

2 ADSP-CM408F EZ-KIT LITE HARDWARE REFERENCE

This chapter describes the hardware design of the ADSP-CM408F EZ-KIT Lite board.

The following topics are covered.

- System Architecture
  Describes the board's configuration and explains how the board components interface with the processor.
- Software-Controlled Switches (SoftConfig)
  Lists and describes the processor signals routed through the software-controlled switches.
- Push Buttons and Switches
  Shows the locations and describes the push buttons and switches.
- Jumpers
  Shows the locations and describes the configuration jumpers.
- LEDs
  Shows the locations and describes the LEDs.
- Connectors
  Shows the locations and provides part numbers for the on-board connectors. In addition, the manufacturer and part number information is provided for the mating parts.

System Architecture

This section describes the processor's configuration on the EZ-KIT Lite board (Figure 2-1).

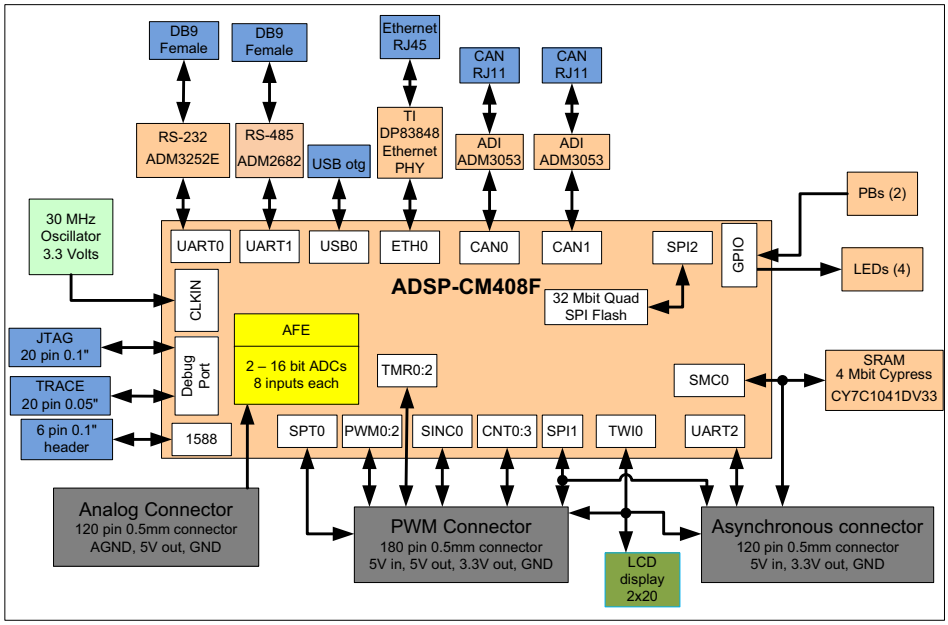


Figure 2-1. EZ-KIT Lite Block Diagram

This EZ-KIT Lite is designed to demonstrate the ADSP-CM408F processor's capabilities. The ADSP-CM408F EZ-KIT Lite has a 30 MHz input clock and runs at 240 MHZ internally.

USB circuitry and a mini USB AB connector are provided for connecting to the EZ-KIT Lite as a host or a device. The frequency for the USB circuit is generated internally to the processor.

User I/O to the processor is provided in the form of two user push buttons and four 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. See ADSP-CM408F EZ-KIT Lite Schematic for more information.

Software-Controlled Switches (SoftConfig)

On the ADSP-CM408F EZ-KIT Lite, most of the traditional mechanical switches have been replaced by I^2C software-controlled switches. The remaining mechanical switches are provided for the boot mode and push buttons. Reference any `SoftConfig*.c` file found in the installation directory for an example of how to set up the SoftConfig feature of the ADSP-CM408F EZ-KIT Lite 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 from ADI is used, there should be little need to reference this section.

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 the same FET and bus switch components that are on the EZ-KIT Lite.

After this generic discussion there is a detailed explanation of the SoftConfig interface specific to the ADSP-CM408F EZ-KIT Lite.

Figure 2-2 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 would disconnect EXAMPLE_SIGNAL_C from EXAMPLE_SIGNAL_D.

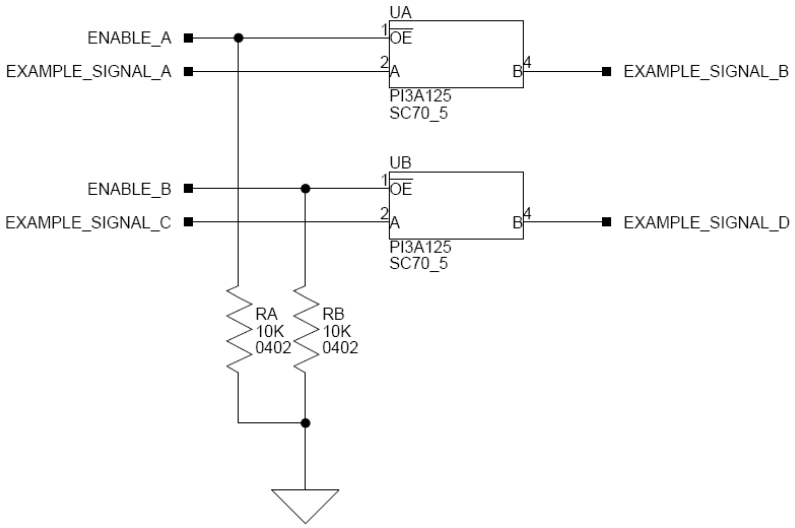


Figure 2-2. Example of Individual FET Switches

Figure 2-3 shows the equivalent circuit to Figure 2-2 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.

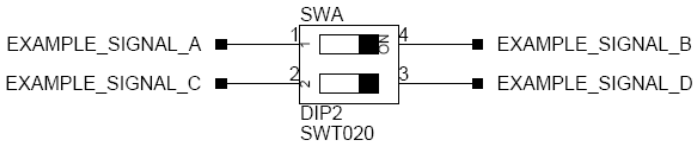


Figure 2-3. Example of Mechanical Switch Equivalent to Figure 2-2

Figure 2-4 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 (eg. OB1) and the letter on the upper group (eg. OB2). 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 2-5 shows the equivalent circuit to Figure 2-4 but utilizes mechanical switches. Notice the default for reference designators SWC and SWD 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 SWE and SWF is OFF. In order to connect the letters instead of the numbers, the user physically changes all switches on SWC and SWD to the OFF position and all switches on SWE and SEF to the ON position.

Software-Controlled Switches (SoftConfig)

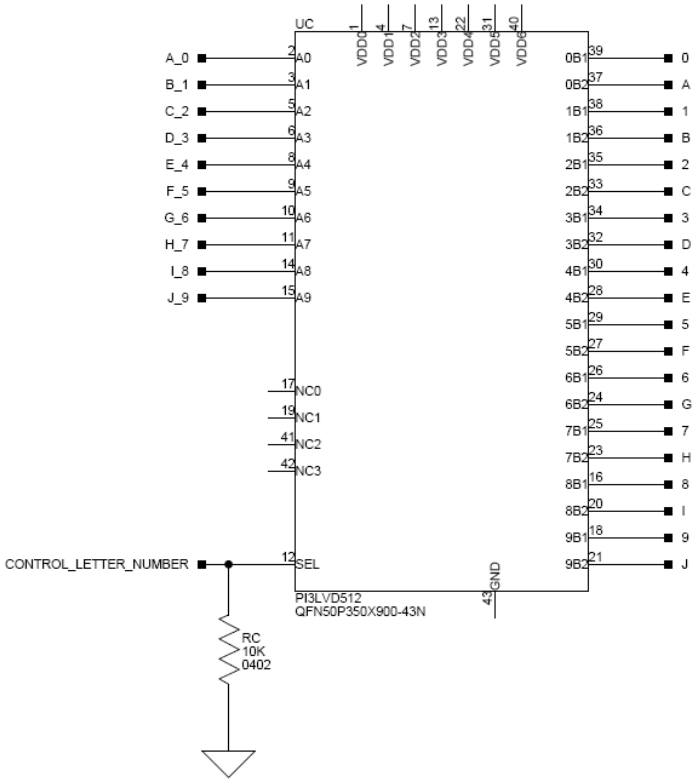


Figure 2-4. Example of Bus Switch

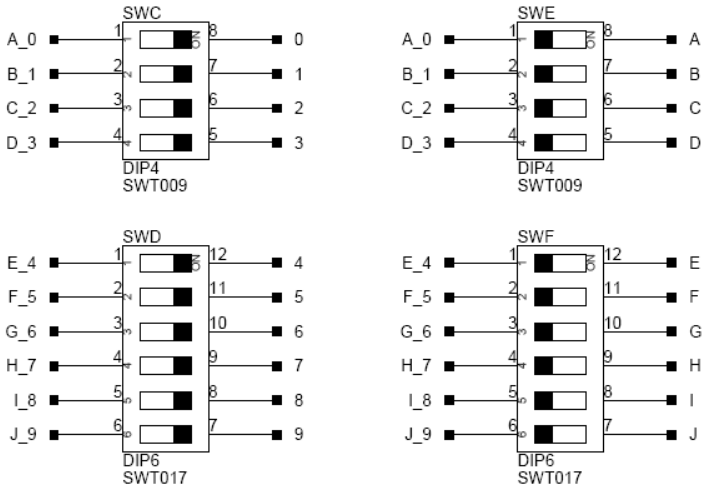


Figure 2-5. Example of Mechanical Switch Equivalent to Figure 2-4

SoftConfig on the ADSP-CM408F EZ-KIT LITE

Two Microchip MCP23017 GPIO expanders provide control for individual electronic switches. The TWI0 interface of the processor communicates with the Microchip devices.There are 33 individual switches with default settings that enable basic board functionality.

Table 2-1 lists the ADSP-CM408F processor and EZ-KIT Lite interfaces that are available by default. Note that only interfaces affected by software switches are listed in Table 2-1.

Table 2-1. Default ADSP-CM408F Processor Interface Availability

Interface	Availability by Default
UART0	RS-232 RX, TX and RTS enabled by default. SoftConfig required for other functionality.
UART1	RS-485 is connected by default but not enabled. SoftConfig is required to enable.
CAN0	Enabled
CAN1	Enabled
EMAC0	RMII interface, management data input/output and 50 MHz oscillator disabled by default. PHYINT disconnected from processor by default.
Push buttons	Enabled (except for wake push button)
LEDs	Enabled

Programming SoftConfig Switches

On the ADSP-CM408F EZ-KIT Lite, two Microchip MCP23017 devices exist. Each of these devices have the following programming characteristics:

- Each switch has two programmable GPIO registers.

GPIO Register	Register Address
GPIOA	0x12
GPIOB	0x13

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

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

  The signals must be programmed as output signals to override their default values. The following table shows the Microchip register addresses and the values that must be written to them to program the signals as output signals.

IODIR Register	IODIR Register Address	Value to be Written to Program Signals as Outputs
IODIRA	0x00	0
IODIRB	0x01	0

Each of the examples in the ADSP-CM40x Enablement Software include 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_CM408F.c` file in each example.

The following tables (Table 2-2 and Table 2-3) outline the default values for each of the two Microchip MCP23017 devices.

Table 2-2. I^2C Hardware Address 0x40

GPIO	MCP23017 Register Address	Default Value
GPIOA	0x12	0xE0
GPIOB	0x13	0x00

Table 2-3. I^2C Hardware Address 0x42

GPIO	MCP23017 Register Address	Default Value
GPIOA	0x12	0xB9
GPIOB	0x13	0x3F

The ADSP-CM408F EZ-KIT Lite Schematic shows how the two Microchip GPIO expanders are connected to the board's ICs.

Table 2-4 and Table 2-5 show the output signals of the Microchip GPIO expander (U40), 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 under the **FET** column. The **Component Connected** column shows the board IC that is connected if the FET is enabled. The Microchip (U40) is controlling the enable signal of a FET switch. Also note that if a particular functionality of the processor signal is being used, it will be in **bold font** under the **Processor Signal** column.

Table 2-4. Output Signals of Microchip GPIO Expander (U40 Port A)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Component Connected	Default
0		Not used				Low
1		Not used				Low
2		Not used				Low
3	UART0RTS_EN	UART0 RTS connected to RS-232 transceiver	U13	PB_04/PWM2_SYNC/ UART0_RTS/ SPT0_ATDV/ SMC0_D12/CNT1_UD	U36	Low
4	UART0RX_EN	UART0 RX connected to RS-232 transceiver	U14	PC_01/UART0_RX/ SMC0_A05/TM0_ACI5	U36	Low
5	UART0CTS_EN	UART0 CTS disconnected from RS-232 transceiver by default	U15	PB_05/PWM2_TRIP0/ UART0_CTS/TM0_T-MR7/SMC0_D13/ CNT1_DG	U36	High

Table 2-4. Output Signals of Microchip GPIO Expander (U40 Port A) (Cont'd)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Component Connected	Default
6	UART0CTS_RTS_LPBK	UART0 CTS and RTS not connected; change to low for looping back RS-232 CTS and RTS signals	U16		U36	High
7	UART0CTS_RST_EN	UART0 CTS signal not connected to input of reset IC	U17		U36	High

Table 2-5. Output Signals of Microchip GPIO Expander (U40 Port B)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Component Connected	Default
0	CAN0_EN	Enables CAN 0, enabled by default	U18/ U19	PC_00/CAN0_TX/ SPT1_BTDV/ UART1_TX/ SMC0_A04 and PB_15/CAN0_RX/ SPT1_ATDV/ UART1_RX/ SMC0_A03/TM0_A-CI4	U39	Low
1	PUSHBUTTON1_EN	PF_10 is used as GPIO input for push button 1, enabled by default	U31	PF_10/ETH0_PTP-CLKIN	U39	Low
2	PUSHBUTTON2_EN	PE_08 is used as GPIO input for push button 2, enabled by default	U30	PE_08/ ETH0_PTPPPS/ SMC0_A22/ CNT2_ZM	U39	Low
3	LED1_GPIO_EN	PE_07 is used as GPIO output for LED1, enabled by default	U28	PE_07/ETH0_PT-PAUXIN/SMC0_A21	U5	Low

Table 2-5. Output Signals of Microchip GPIO Expander (U40 Port B) (Cont'd)

Bit	Signal Name	Description	FET	Processor Signal (if applicable)	Component Connected	Default
4	$\overline{\text{LED2_GPIO_EN}}$	PE_06 is used as GPIO output for LED2, enabled by default	U27	PE_06/SMC0_A20	U5	Low
5	$\overline{\text{LED3_GPIO_EN}}$	PE_05 is used as GPIO output for LED3, enabled by default	U26	PE_05/SMC0_A19	U5	Low
6	$\overline{\text{LED4_GPIO_EN}}$	PE_09 is used as GPIO output for LED4, enabled by default	U25	PE_09/ETH0_CRS/ SMC0_A23/ CNT2_UD	U5	Low
7		Not used				

Table 2-6 and Table 2-7 show the output signals of the Microchip GPIO expander (U41), 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 under the **FET** column. The **Component Connected** column shows the board IC that is connected if the FET is enabled. Note that some of the Microchip (U41) output signals are connected directly to components on the board. However, in most cases, the Microchip (U41) is controlling the enable signal of a FET switch. Also note that if a particular functionality of the processor signal is being used, it will be in **bold font** under the **Processor Signal** column.

Table 2-6. Output Signals of Microchip GPIO Expander (U41 Port A)

Bit	Signal Name	Description	FET/ SWITCH	Processor Signal (if applicable)	Component Connected	Default
0	RS485_RE	Controls RS-485 receiver enable			U39	High
1	RS485_DE	Controls RS-485 driver enable			U39	Low
2	CAN1_EN	Enables CAN 1, enabled by default	U20/U21	PB_11/SINC0_D0/ SPI0_D3/CAN1_TX/ SMC0_AMS0/TM0_A-CLK1 and PB_10/ SINC0_CLK0/ SPI0_D2/CAN1_RX/ SMC0_AWE/TM0_ACI1	U37	Low
3	ETH0_MDIO_BUS_EN	Connects Ethernet management data input/output, disabled by default	U22/U23	PE_11/ETH0_MDC/ SMC0_A24/CNT3_ZM and PE_10/ETH_M-DIO/SMC0_AMS1/ CNT2_DG	U43	High
4	ETHERNET_EN	Connects ETH0 to RMII interface of U32, by default disabled	U32	PF_00, PF_01, PE_12, PE_13, PE_14, PE_09	U43	High
5	PHYINT_EN[1]	Connects Ethernet 0 interrupt signal to Ethernet PHY, not connected by default	U24	PC_06/SPI0_SEL1/ PWM2_DL/SYS_D-SWAKE0	U43	High
6	RMII_CLK_EN	Enables 50 MHz oscillator, disabled by default		PE_15/ETH0_REF-CLK/CNT1_OUTB	U35	Low
7	WAKE_PUSHBUTTON_EN	Connects processor to wake push button, disabled by default	U29	PC_06/SPI0_SEL1/ PWM2_DL/SYS_D-SWAKE0_ACLK3		High

1 This signal is actually active low.

Table 2-7. Output Signals of Microchip GPIO Expander (U41 Port B)

Bit	Signal Name	Description	FET/ SWITCH	Processor Signal (if applicable)	Component Connected	Default
0	$\overline{\text{DATA_LOW_EXP_EN}}$	Connects signals to expansion interface connector J6, disconnected by default	U12	PC_08, PC_09, PC_10, PC_11, PC_12, PC_13, PC-14, PC_15	J6	High
1	$\overline{\text{DATA_HIGH_EXP_EN}}$	Connects signals to expansion interface connector J6, disconnected by default	U11	PD_00, PD_01, PD_02, PD_03, PD_04, PD_05, PD_06, PD_07	J6	High
2	$\overline{\text{TRACE_EXP_EN}}$	Connects signals to expansion interface connector J6, disconnected by default	U51, U52, U53, U54, U55	PE_12, PE_13, PE_09, PE_11, PE_10	J6	High
3	$\overline{\text{PB_08_09_EXP_EN}}$	Connects signals to expansion interface connector J6, disconnected by default	U49/U50	PB_08/PWM2_BH/ TMO_TMR1/ $\overline{\text{UART1_RX}}$/ SMC0_ARDY/ TMO_ACI2 and PB_09/PWM2_BL/ TMO_TMR2/ $\overline{\text{UART1_TX}}$/ SMC0_ARE	J6	High
4	$\overline{\text{ETH_EXP_EN}}$	Connects signals to expansion interface connector J4, disconnected by default	U56, U57, U58, U59, U60	PE_12, PE_13, PE_09, PE_11, PE10	J4	High
5	$\overline{\text{SRAM_BYTE_EN}}$	Connects SRAM ABE0/ 1 signals to SRAM	U4, U7	PE_12, PE_13	U2	High
6		Not used				Low
7		Not used				Low

Push Buttons and Switches

This section describes operation of the push buttons and switches. The push button and switch locations are shown in Figure 2-6.

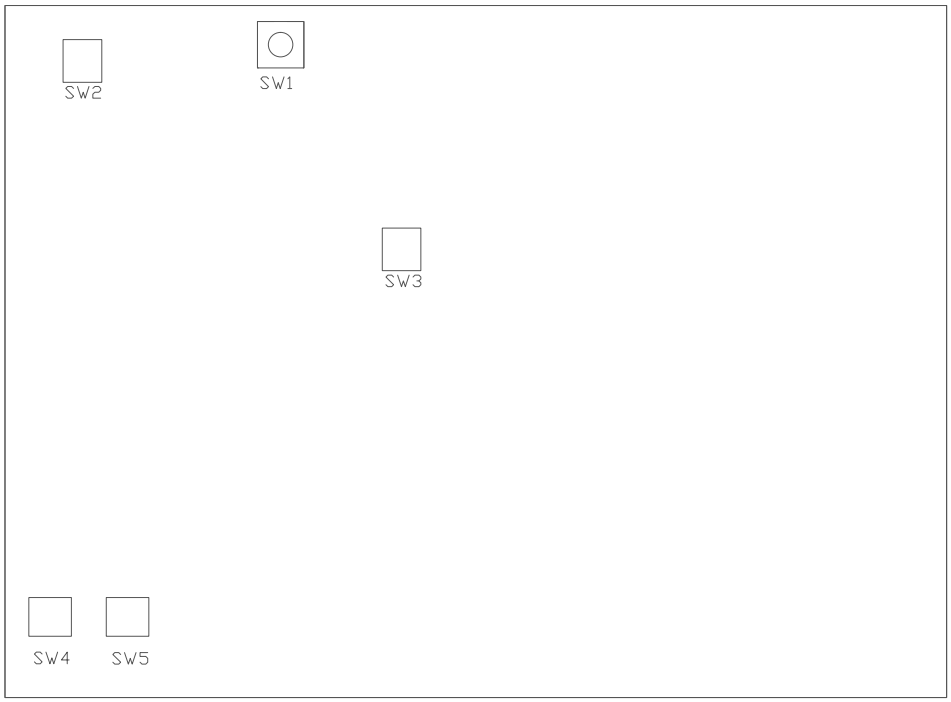


Figure 2-6. Push Button and Boot Mode Switch Locations

Boot Mode Select Switch (SW1)

The rotary switch (SW1) determines the boot mode of the processor. Table 2-8 shows the available boot mode settings. By default, the ADSP-CM408F processor boots from the internal SPI flash memory.

Table 2-8. Boot Mode Select Switch (SW1)

SW1 Position	Processor Boot Mode
0	No Boot – Idle
1	**SPI master boot (internal SP12). Default boot mode.**
2	SPI slave boot (SPI0)
3	UART boot (UART0)

Reset Push Button (SW2)

The reset push button (SW2) resets the following ICs: processor (U1), GPIO extender (U40), GPIO extender (U41), and Ethernet PHY (U43). The reset also is connected to the expansion interface via the $\overline{\text{SYS_HWRST}}$ signal.

GPIO Push Buttons (SW4-5)

The GPIO push buttons (SW4 and SW5) are connected to the processor's signals PF_10/ETH0_PTPCLKIN and PE_08/ETH0_PTPPPS/SMC0_A22/CNT2_ZM, respectively. The signals are connected by default.

Wake Push Button (SW3)

The wake push button (SW3) is connected to the processor's signal PC_06/SPI0_SEL1/PWM2_DL/SYS_DSWAKE0. The signal is disconnected by default through SoftConfig.

Jumpers

This section describes functionality of the configuration jumpers. Figure 2-7 shows the jumper locations.

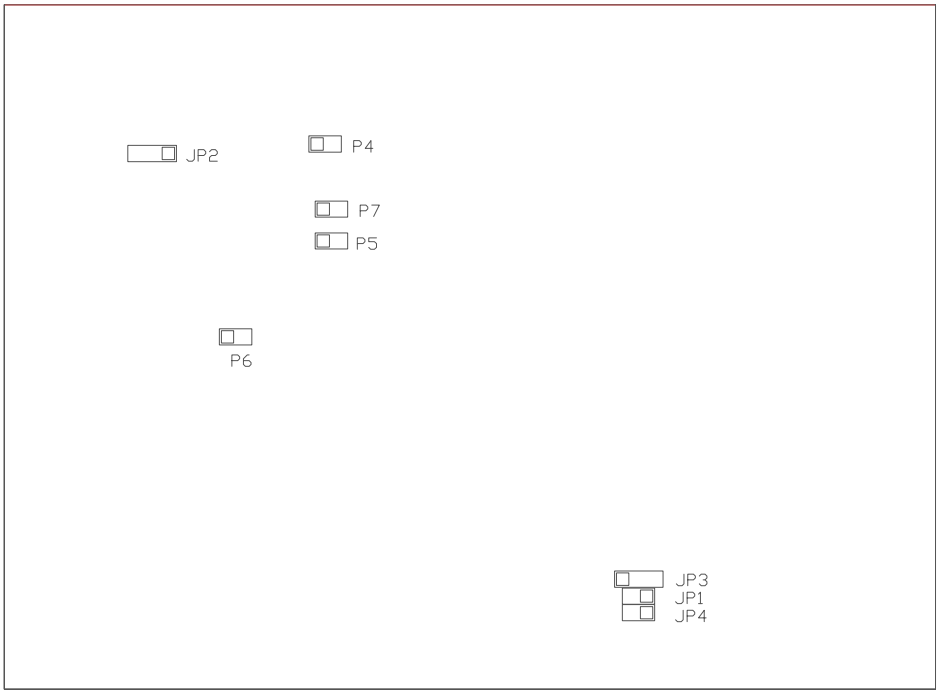


Figure 2-7. Jumper Locations

VREF1 External Source Jumper (JP1)

The VREF1 external source jumper (JP1) selects whether an internal or external voltage reference supplies the VREF1 signal of the processor. When a jumper on JP1 is not installed (default), the internal voltage reference supplies VREF1. When a jumper on JP1 is installed, the external Analog Devices ADR441 ultra-low noise voltage reference (U47) supplies VREF1. Configure the processor's registers accordingly for the latter case.

Power Select Jumper (JP2)

The power select jumper (JP2) selects the wall power (5V) when a jumper is placed on positions 1 and 2. When a jumper is placed on positions 2 and 3, power from pins 177, 178, 179 and 180 of the PWM connector (J6) is supplied to the board. The default setting is positions 1 and 2, which selects wall power.

Buffer Input Select Jumper (JP3)

The buffer input select jumper (JP3) selects the input to the ADA4889 unity gain op amp buffer (U33). The processor's internal input is selected by placing a jumper on pins 1 and 2 of JP3 (default).

The external VREF0 input, supplied by the Analog Devices ADR441 ultra-low noise voltage reference (U6), is selected by placing a jumper on pins 2 and 3 of JP3.

VREF0 External Source Jumper (JP4)

The VREF0 external source jumper (JP4) selects whether an internal or external voltage reference supplies the VREF0 signal of the processor. When a jumper on JP4 is not installed (default), the internal voltage reference supplies VREF0. When a jumper on JP4 is installed, the external Analog Devices ADR441 ultra-low noise voltage reference (U6) supplies VREF0. Configure the processor's registers accordingly for the latter case.

Power Jumpers (P4-7)

Remove jumpers listed in Table 2-9 to measure the respective voltage across the adjacent sense resistor.

Table 2-9. Power Jumpers

Power Jumper	Resistor
P4	USB_VBUS
P5	VDD_EXT
P6	VDD_INT
P7	3.3V

LEDs

This section describes the on-board LEDs. Figure 2-8 shows the LED locations.

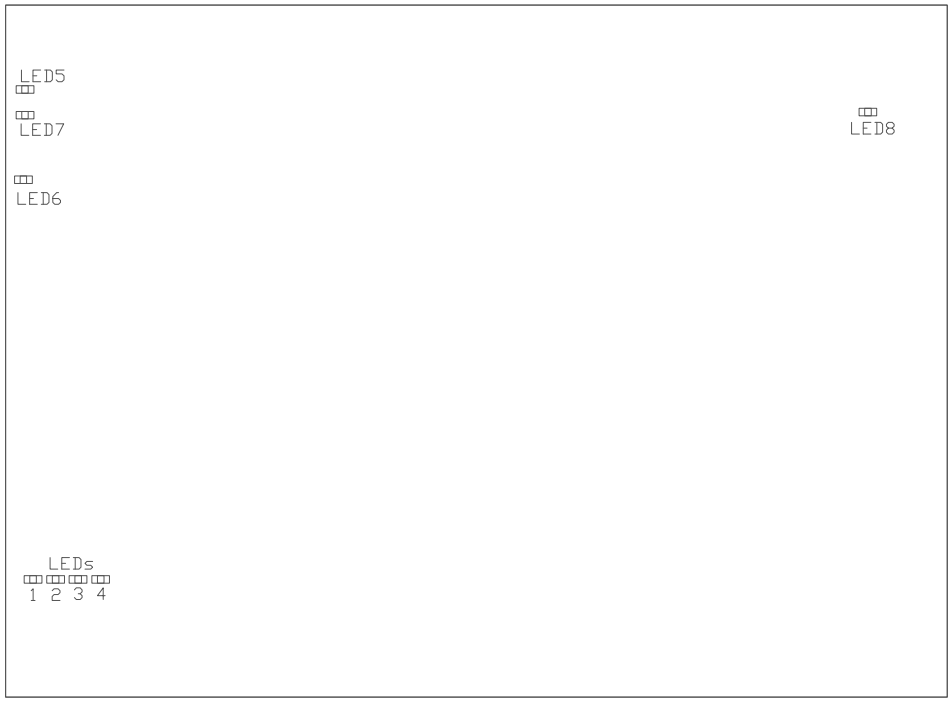


Figure 2-8. LED Locations

GPIO LEDs (LED1–4)

Four LEDs are connected to the general-purpose I/O pins of the processor (see Table 2-10). The LEDs are active high and are ON (amber) by writing a 1 to the correct processor signal.

Table 2-10. GPIO LEDs

LED Reference Designator	Processor Programmable Flag Pin
LED1	PE_07
LED2	PE_06
LED3	PE_05
LED4	PE_09

Reset LED (LED5)

When LED5 is ON (red), it indicates that the master reset of all the major ICs is active. The reset LED is controlled by the Analog Devices ADM708 supervisory reset circuit. A master reset is asserted by pressing SW2 which activates LED5. For more information, see Reset Push Button (SW2).

Ethernet Speed LED (LED6)

The Ethernet speed LED (LED6) is a green LED that shows the connection speed when the Ethernet is enabled. When LED6 is ON, the speed is 100 Mb/s; when LED6 is OFF, the speed is 10 Mb/s. For more information, see Ethernet Interface.

Power LED (LED7)

When LED7 is ON (green), it indicates that power is being supplied to the board properly. For more information, see Power Architecture.

SYS_FAULT LED (LED8)

When SYS_FAULT LED LED8 (red) is ON, it indicates a system fault. For more information, refer to the *ADSP-CM40x Mixed-Signal Control Processor Hardware Reference*.

Connectors

This section describes connector functionality and provides information about mating connectors. The connector locations are shown in Figure 2-9.

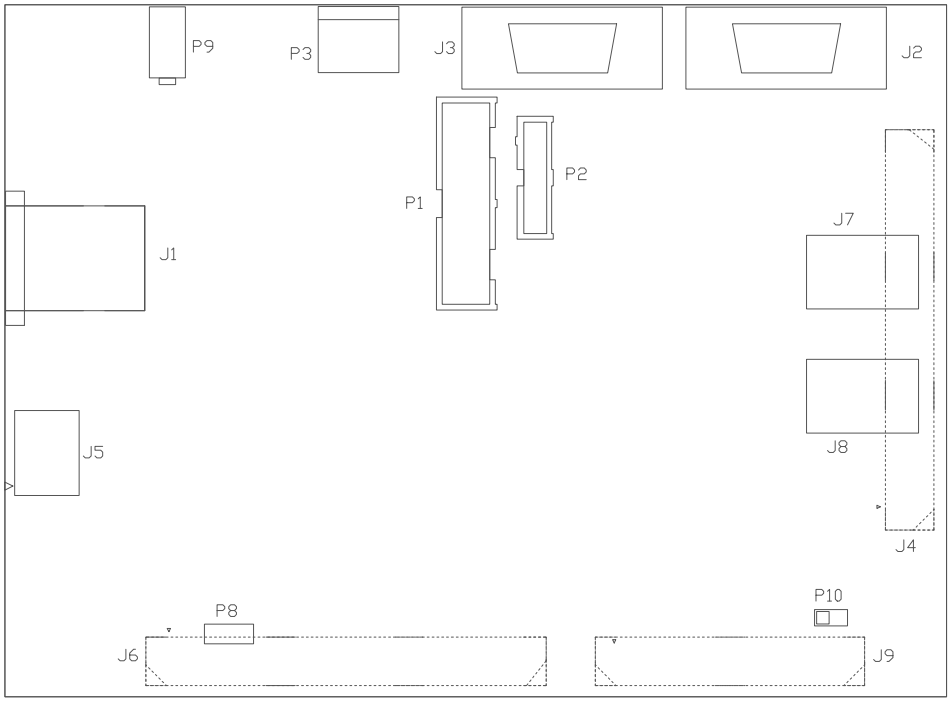


Figure 2-9. Connector Locations

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

Ethernet Connector (J1)

Part Description	Manufacturer	Part Number
RJ45	PULSE ELECTRONICS	J0011D21BNL
Mating Cable		
Standard Ethernet cable		

RS-485 Connector (J2)

Part Description	Manufacturer	Part Number
DB9 female	NORCOMP	191-009-213-L-571

DCE UART Connector (J3)

Part Description	Manufacturer	Part Number
DB9 female	NORCOMP	191-009-213-L-571

Asynch or Memory Connector (J4)

Part Description	Manufacturer	Part Number
180-pin high speed socket	SAMTEC	QSH-090-F-D_A
Mating Connector		
180-pin high speed header	SAMTEC	QTH-090-01-F-D-A

Character Display Connector (J5)

The character display connector (J5) is a socket that mates with the 20 x 2 character display.

Part Description	Manufacturer	Part Number
IDC 5x2 SMT	SAMTEC	SSW-105-22-F-D-VS
Mating Connector		
20x2 character display with back-light	NEW HAVEN DISPLAY	NHD-0220D3Z-FL-GBW (requires header)

PWM Connector (J6)

Part Description	Manufacturer	Part Number
180-pin high speed socket	SAMTEC	QSH-090-F-D_A
Mating Connector		
180-pin high speed header	SAMTEC	QTH-090-01-F-D-A

CAN0 Connector (J7)

Part Description	Manufacturer	Part Number
RJ11 vertical	DIGIKEY	A31431-ND
Mating Connector		
RJ11 cable		

CAN1 Connector (J8)

Part Description	Manufacturer	Part Number
RJ11 vertical	DIGIKEY	A31431-ND
Mating Connector		
RJ11 cable		

Analog Connector (J9)

Part Description	Manufacturer	Part Number
120-pin high speed socket	SAMTEC	QSH-060-F-D_A
Mating Connector		
120-pin high speed header	SAMTEC	QTH-060-01-F-D-A

JTAG/SWD Connector (P1)

The JTAG/SWD/SWV header (P1) provides debug connectivity for the microprocessor. This is a 0.1” connector from SAMTEC (SHF-110-01-L-D-TH). For more information, see Debug Interface.

TRACE and JTAG/SWD/SWV Connector (P2)

The TRACE and JTAG/SWD/SWV Connector (P1) provides connectivity to the microprocessor’s trace interface. This is a 0.05” connector from TE Connectivity (5103308-5).

Pin 7 is cut to provide keying.

Refer to the SoftConfig tables for information on enabling the Trace signals, specifically the $\overline{\text{TRACE_EXP_EN}}$ signal.

USB Connector (P3)

USB FS only mode.

Part Description	Manufacturer	Part Number
USB mini-B	MOLEX	56579-0576

IEEE 1588 Connector (P8)

P8 allows probing of Ethernet IEEE 1588 signals. P8 is a 0.1" header and the pinout can be found in ADSP-CM408F EZ-KIT Lite Schematic.

Power Connector (P9)

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

VREF Buffered Connector (P10)

The VREF buffered connector provides a means to measure the voltage of the voltage reference. There is an adjacent analog grounding point (TP13).

Connectors

A ADSP-CM408F EZ-KIT LITE BILL OF MATERIALS

The bill of materials corresponds to ADSP-CM408F EZ-KIT Lite Schematic.

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
1	1	ADM708SARZ SOIC8	U42	ANALOG DEVICES	ADM708SARZ
2	2	ADR441ARMZ MSOP8	U6,U47	ANALOG DEVICES	ADR441ARMZ
3	1	ADP2118ACPZ QFN65P400X400X80-17N	VR2	ANALOG DEVICES	ADP2118ACPZ
4	1	ADP2119ACPZ-R7 DFN50P300X300-11N	VR1	ANALOG DEVICES	ADP2119ACPZ-R7
5	1	ADA4899 SOIC8	U33	ANALOG DEVICES	ADA4899-1YRDZ-R7
6	1	ADM2682E SOIC127P1032X265-16N	U39	ANALOG DEVICES	ADM2682EBRIZ
7	1	ADM3252E BGA44C100P11X11_1200X1200X103	U36	ANALOG DEVICES	ADM3252EABCZ
8	2	ADM3053 SOIC127P1032X265-20N	U37,U38	ANALOG DEVICES	ADM3053BRWZ
9	1	ADSP-CM408BSWZ LQFP176_EP	U1	ANALOG DEVICES	ADSP-CM408FBSWZENG

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
10	62	0.1UF 10V 10% 0402	C1,C5-C7,C17,C18,C22,C25,C26,C29,C31,C34-C36,C40,C43,C45,C48,C50,C54-C56,C59,C60,C62-C65,C67,C68,C72,C78,C79,C101,C102,C104,C109,C119,C120,C122-C125,C128-C130,C132,C135,C136,C138,C139,C143,C148-C150,C153-C157,C174,C179	AVX	0402ZD104KAT2A
11	74	0.01UF 16V 10% 0402	C2,C8,C9,C19-C21,C24,C30,C32,C33,C46,C47,C49,C51,C53,C61,C66,C69-C71,C73-C76,C80-C90,C92,C110-C118,C121,C131,C134,C141,C144,C151,C152,C158-C173,C175-C178,C180,C181	AVX	0402YC103KAT2A
12	1	4.7UF 25V 20% 0805	C142	AVX	0805ZD475KAT2A
13	1	10UF 16V 10% 1210	C98	AVX	1210YD106KAT2A
14	2	1000PF 50V 5% 1206	C97,C99	AVX	12065A102JAT2A

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
15	2	680 1/16W 1% 0402	R210,R211	BC COMPONENTS	2312 275 16801
16	1	1.5UH 20% IND003	L2	COIL CRAFT	DO1608C-152MLC
17	1	1.5UH 20% INDC4040X210N	L1	COILCRAFT	XAL4020-152MEB
18	1	ROTARY SWT027	SW1	COPAL	S-8110
19	1	CY7C1041CV33 BGA48_75_810	U2	CYPRESS	CY7C1041DV33-10BVXI
20	1	PWR .65MM CON045	P9	DIGI-KEY	CP1-023-ND
21	1	50MHZ OSC012	U35	DIGI-KEY	300-8264-2-ND
22	2	MCP23017 QFN65P600X600-29N	U40,U41	DIGI-KEY	MCP23017-E/ML-ND
23	2	1UF 16V 10% 0805	C95,C96	DIGI-KEY	399-1284-2-ND
24	2	GREEN LED_0603	LED6,LED7	DIGI-KEY	475-1409-2-ND
25	3	0.1UF 16V 10% 0402	C37-C39	DIGI-KEY	587-1451-2-ND
26	1	15KV ESDA6V1SC SOT95P280-6N	D4	DIGI-KEY	497-6637-1-ND
27	1	30MHZ OSC012	U34	DIGI-KEY	300-8257-1-ND
28	2	RED LED_0603	LED5,LED8	DIGI-KEY	475-2512-2-ND
29	4	YELLOW LED_0603	LED1-LED4	DIGI-KEY	475-2558-1-ND
30	1	10UF 6.3V 20% 0402	C14	DIGI-KEY	445-8920-1-ND
31	1	SN74CB3Q3245 TSSOP20	U32	DIGI-KEY	296-19130-1-ND
32	1	MIC2025-1 SOIC8	U44	DIGI-KEY	576-1057-ND
33	1	STD2805T4 TO228P972X240-3N	Q1	DIGI-KEY	497-7465-1-ND
34	8	IDC 2PIN_-JUMPER_SHORT	SJ1-SJ8	DIGI-KEY	S9001-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
35	1	150UF 10V 10% D	CT2	DIGI-KEY	478-3321-2-ND
36	2	107.0 1/10W 1% 0805	R101,R107	DIGI-KEY	311-107CRTR-ND
37	1	1K 1/10W 5% 0603	R170	DIGI-KEY	311-1.0KGRTR-ND
38	2	4700PF 16V 10% 0603	C44,C52	DIGI-KEY	311-1083-2-ND
39	10	2.21K 1/10W 1% 0603	R78,R80,R84-R86,R108-R112	DIGI-KEY	311-2.21KHRTR-ND
40	3	100 1/16W 5% 0402	R132,R137,R139	DIGI-KEY	311-100JRTR-ND
41	7	330.0 1/16W 1% 0402	R115-R119,R131,R172	DIGI-KEY	541-330LCT-ND
42	2	165.0 1/10W 1% 0603	R102,R106	DIGI-KEY	P165HTR-ND
43	1	220.0 1/10W 1% 0603	R77	DIGI-KEY	P220HTR-ND
44	1	4.87K 1/10W 1% 0402	R82	DIGI-KEY	541-4.87KHCT-ND
45	7	IDC 2X1 IDC2X1	JP1,JP4,P4-P7,P10	FCI	90726-402HLF
46	2	IDC 3X1 IDC3X1	JP2,JP3	FCI	90726-403HLF
47	1	120.0 1/16W 1% 0603	R44	FEC	933-0496
48	1	IDT74FCT3244APY SSOP20	U5	IDT	IDT74FCT3244APYG
49	1	TEST LOOP LOOP_2838	GP1	KEYSTONE	5016
50	1	VARISTOR V5.5MLA 30A 0603	R1	LITTLEFUSE	V5.5MLA0603
51	1	THERM 0.5A 0.4 1206	R186	LITTLEFUSE	1206L050-C
52	1	USB_MINI-AB 5PIN CON052	P3	MOLEX	56579-0576
53	1	IDC 10X2 TE_5103308-5	P1	MOUSER	571-5103308-5

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
54	7	10UF 6.3V 20% 0603	C10,C11,C13, C126,C127,C133,C140	MULTICOMP	MCCA000517
55	1	190 100MHZ 5A FER002	FER4	MURATA	DLW5BSN191SQ2
56	1	DP83848 LQFP48	U43	NATIONAL SEMI	DP83848CVV/NOPB
57	2	DB9 9PIN CON038	J2,J3	NORCOMP	191-009-213-L-571
58	1	GTL2002 TSSOP8	U10	NPX	GTL2002DP,118
59	3	5A MBRS540T3G SMC	D6-D8	ON SEMI	MBRS540T3G
60	1	15KV ESD7004 DFN50P250X100-10N	D5	ON SEMI	ESD7004MUTAG
61	4	MOMENTARY SWT024	SW2-SW5	PANASONIC	EVQ-Q2K03W
62	27	0 1/16W 5% 0402	R6,R8,R17,R45,R46,R49,R62,R63,R146,R147,R151,R160,R163,R168, R185,R190-R193,R196,R198, R199,R202,R214,R229,R230, R232	PANASONIC	ERJ-2GE0R00X
63	13	0 1/16W 5% 0402	R11,R12,R47, R48,R149,R159,R164,R166, R184,R200,R201,R212,R213	PANASONIC	ERJ-2GE0R00X
64	4	1UF 6.3V 20% 0402	C12,C91,C93, C94	PANASONIC	ECJ-0EB0J105M

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
65	11	10UF 10V 10% 0805	C15,C16,C23, C27,C28,C41, C42,C57,C58, C77,C137	PANASONIC	ECJ-2FB1A106K
66	1	1.50K 1/16W 1% 0402	R91	PANASONIC	ERJ-2RKF1501X
67	2	27K 1/16W 5% 0402	R187,R188	PANASONIC	ERJ-2GEJ273X
68	4	60.4 1/10W 1% 0603	R64,R65,R68, R69	PANASONIC	ERJ-3EKF60R4V
69	1	45.3K 1/10W 1% 0402	R157	PANASONIC	ERJ-2RKF4532X
70	1	24.9 1/10W 1% 0402	R13	PANASONIC	ERJ-2RKF24R9X
71	1	10UF 10V 20% ELEC_4MM	CT1	PANASONIC	EEE-1AA100NR
72	33	PI3A125 SC70_5	U4,U7,U13-U 31,U49-U60	PERICOM	PI3A125CEX
73	2	PI4ULS3V08M QFN40P300X600X75-33N	U11,U12	PERICOM	PI4ULS3V08MZLE
74	4	0.0 1/10W 1% 0603	R16,R176,R17 7,R203	PHYCOMP	232270296001L
75	1	RJ45 W/LEDS CON065	J1	PULSE ENG.	J0011D21BNL
76	1	200.0K 1/16W 1% 0402	R209	ROHM	MCR01MZPF2003
77	1	IDC 3X2 IDC3X2_SMT	P8	SAMTEC	TSM-103-01-T-DV
78	1	IDC 5X2 IDC5x2_SMT_F	J5	SAMTEC	SSW-105-22-F-D-VS
79	1	0.05 10X2 SAM-TEC_SHF-110-01-L-D-TH	P2	SAMTEC	SHF-110-01-L-D-TH

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
80	2	0.5MM 180PIN SAMTEC_QSH-090-F-D-A	J4,J6	SAMTEC	QSH-090-01-F-D-A
81	1	0.5MM 120PIN SAMTEC_QSH-060-F-D-A	J9	SAMTEC	QSH-060-01-F-D-A
82	4	0.05 1/2W 1% 1206	R150,R154,R156,R165	SEI	CSF 1/2 0.05 1%R
83	10	49.9 1/16W 1% 0402	R89,R90,R92,R93,R96,R98,R103-R105,R155	STACKPOLE	RMCF0402FT49R9
84	3	600 100MHZ 500MA 1206	FER1-FER3	STEWARD	HZ1206B601R-10
85	1	74LVC14A SOIC14	U3	TI	74LVC14AD
86	1	SN74LVC1G08 SOT23-5	U48	TI	SN74LVC1G08DBVE
87	2	SN74LVC1G08 SOT23-5	U45,U46	TI	SN74LVC1G08DBVE
88	2	RJ11 4PIN CON039	J7,J8	TYCO	5558872-1
89	1	3A RESETABLE FUS004	F1	TYCO	SMD300F-2
90	3	0 1/8W 5% 0805	R15,R97,R178	VISHAY	CRCW08050000Z0EA
91	20	10K 1/16W 5% 0402	R2-R5,R30-R32,R36,R37,R39,R41,R42,R51,R75,R152,R153,R182,R197,R219,R220	VISHAY	CRCW040210K0FKED

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
92	78	10K 1/16W 5% 0402	R10,R14,R18-R20,R27-R29,R33-R35,R38,R40,R43,R52-R58,R66,R67,R70,R71,R79,R81,R83,R87,R88,R94,R95,R100,R113,R114,R120-R130,R133-R135,R138,R140-R143,R148,R158,R161,R171,R173-R175,R180,R189,R194,R195,R215-R218,R221-R228,R231	VISHAY	CRCW040210K0FKED
93	9	33 1/16W 5% 0402	R7,R9,R59,R60,R76,R99,R136,R144,R145	VISHAY	CRCW040233R0JNEA
94	2	10K 1/10W 5% 0603	R204,R205	VISHAY	CRCW060310K0JNEA
95	1	1M 1/10W 5% 0603	R179	VISHAY	CRCW06031M00FNEA
96	6	10 1/10W 5% 0603	R61,R72-R74,R162,R167	VISHAY	CRCW060310R0JNEA
97	1	30A GSOT05 SOT23-3	D1	VISHAY	GSOT05-GS08
98	2	30A GSOT03 SOT23-3	D2,D3	VISHAY	GSOT03-GS08
99	6	22UF 16V 10% 1210	C100,C103,C105-C108	YAIYO YUDEN	EMK325BJ226KM-T

2

3

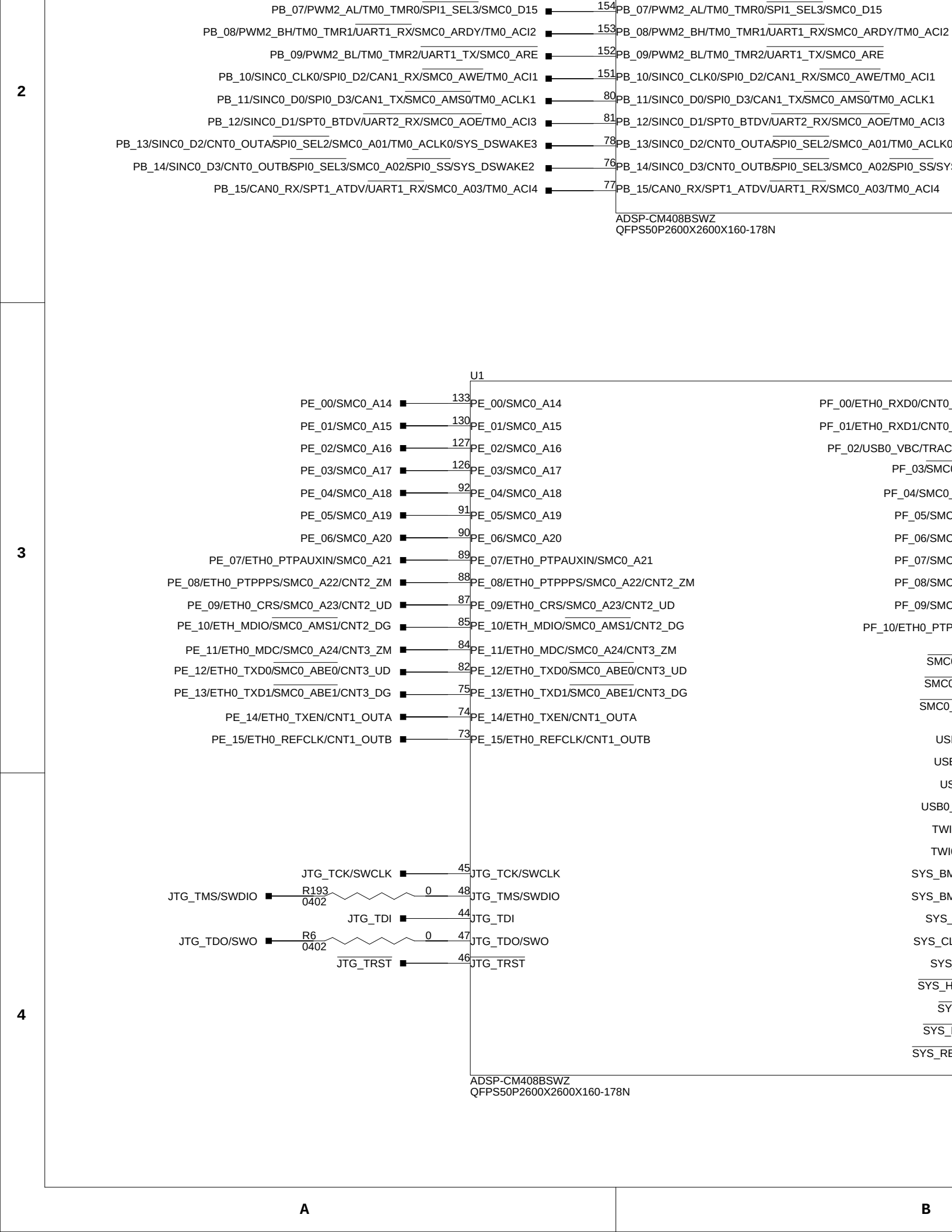
4

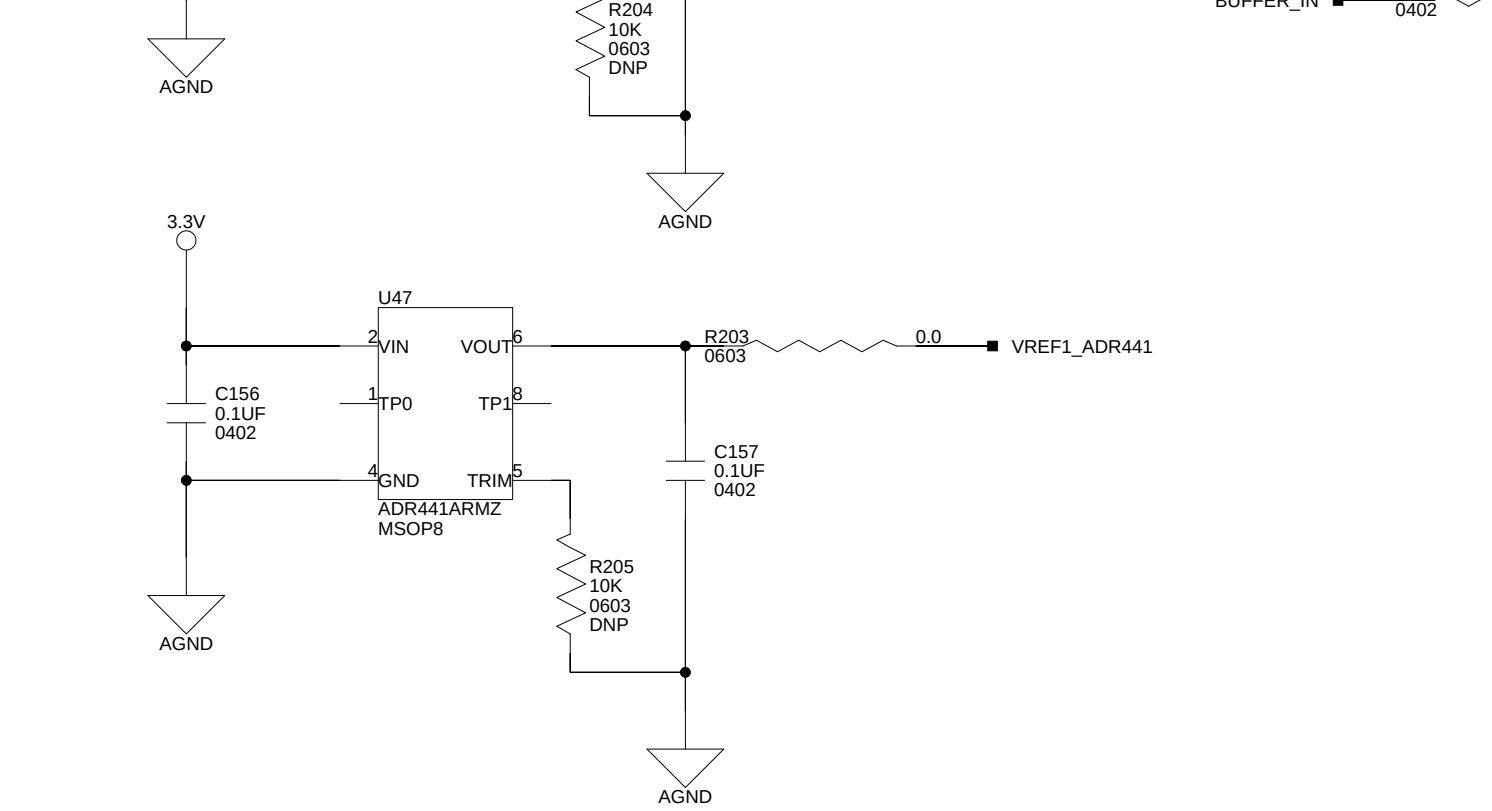
ADSP-

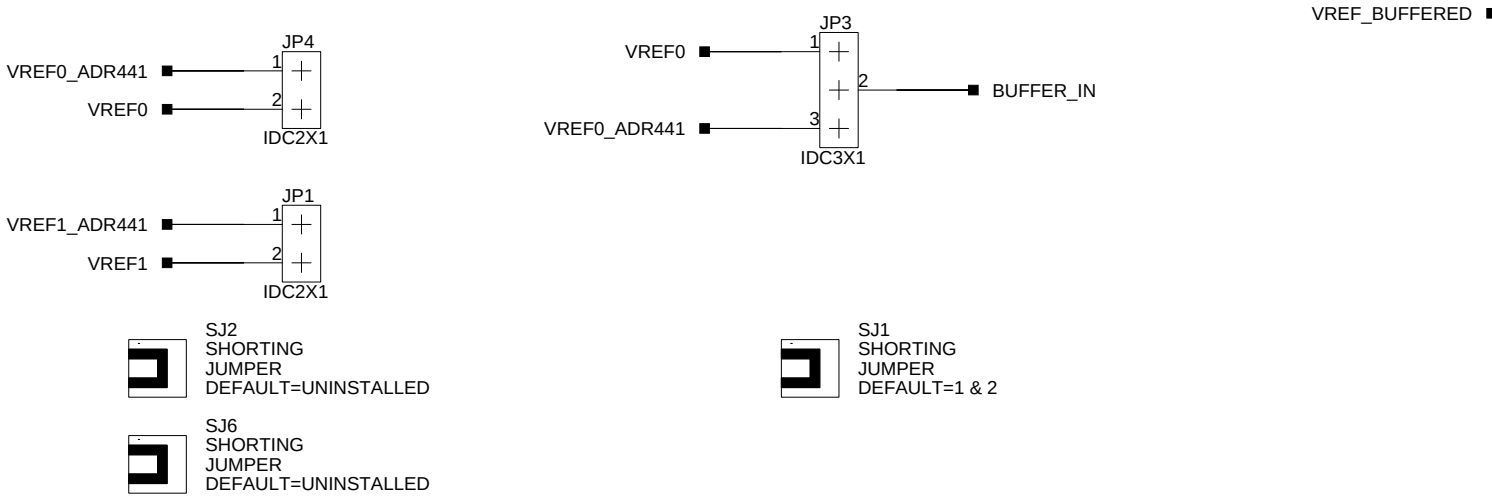
S

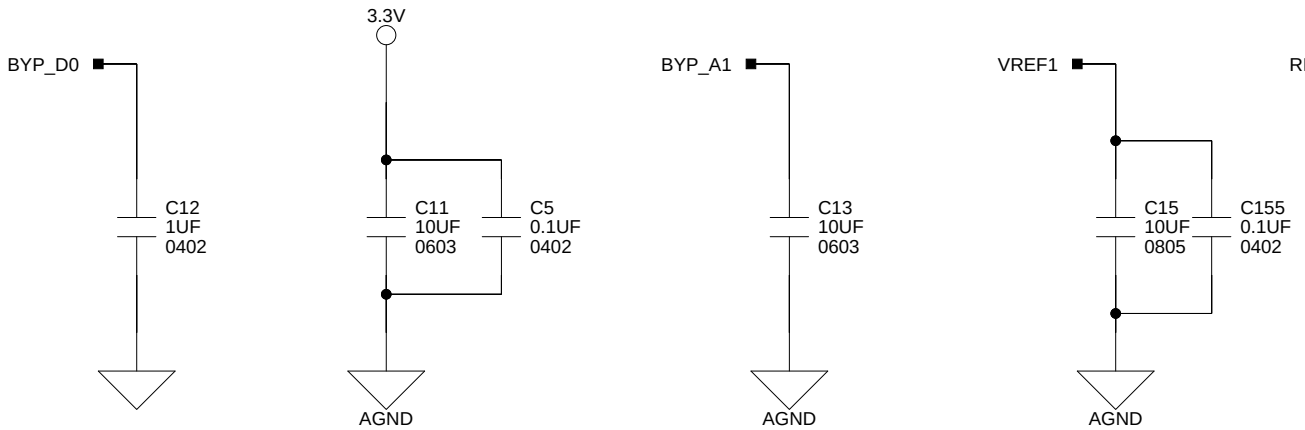
A

B


PB_07/PWM2_AL/TM0_TMR0/SPI1_SEL3/SMC0_D15
PB_08/PWM2_BH/TM0_TMR1/UART1_RX/SMC0_ARDY/TM0_ACI2
PB_09/PWM2_BL/TM0_TMR2/UART1_TX/SMC0_ARE
PB_10/SINC0_CLK0/SPI0_D2/CAN1_RX/SMC0_AWE/TM0_ACI1
PB_11/SINC0_D0/SPI0_D3/CAN1_TX/SMC0_AMS0/TM0_ACLK1
PB_12/SINC0_D1/SPT0_BTDV/UART2_RX/SMC0_AOE/TM0_ACI3
PB_13/SINC0_D2/CNT0_OUTA/SPI0_SEL2/SMC0_A01/TM0_ACLK0/SYS_DSWAKE3
PB_14/SINC0_D3/CNT0_OUTB/SPI0_SEL3/SMC0_A02/SPI0_SS/SYS_DSWAKE2
PB_15/CAN0_RX/SPT1_ATDV/UART1_RX/SMC0_A03/TM0_ACI4
154
153
152
151
80
81
78
76
77
ADSP-CM408BSWZ
QFPS50P2600X2600X160-178N
U1
PE_00/SMC0_A14
PE_01/SMC0_A15
PE_02/SMC0_A16
PE_03/SMC0_A17
PE_04/SMC0_A18
PE_05/SMC0_A19
PE_06/SMC0_A20
PE_07/ETH0_PTPAUXIN/SMC0_A21
PE_08/ETH0_PTPPPS/SMC0_A22/CNT2_ZM
PE_09/ETH0_CRS/SMC0_A23/CNT2_UD
PE_10/ETH_MDIO/SMC0_AMS1/CNT2_DG
PE_11/ETH0_MDC/SMC0_A24/CNT3_ZM
PE_12/ETH0_TXD0/SMC0_ABE0/CNT3_UD
PE_13/ETH0_TXD1/SMC0_ABE1/CNT3_DG
PE_14/ETH0_TXEN/CNT1_OUTA
PE_15/ETH0_REFCLK/CNT1_OUTB
133
130
127
126
92
91
90
89
88
87
85
84
82
75
74
73
JTG_TCK/SWCLK
JTG_TMS/SWDIO
JTG_TDI
JTG_TDO/SWO
JTG_TRST
45
48
44
47
46
R193
0402
0
R6
0402
0
ADSP-CM408BSWZ
QFPS50P2600X2600X160-178N







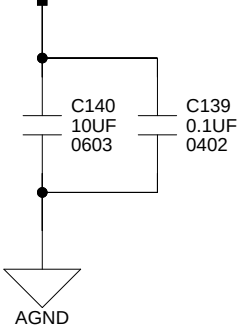
Pins 95-center pad

Pins 105-106

Pins 107-106

Pins 108-109

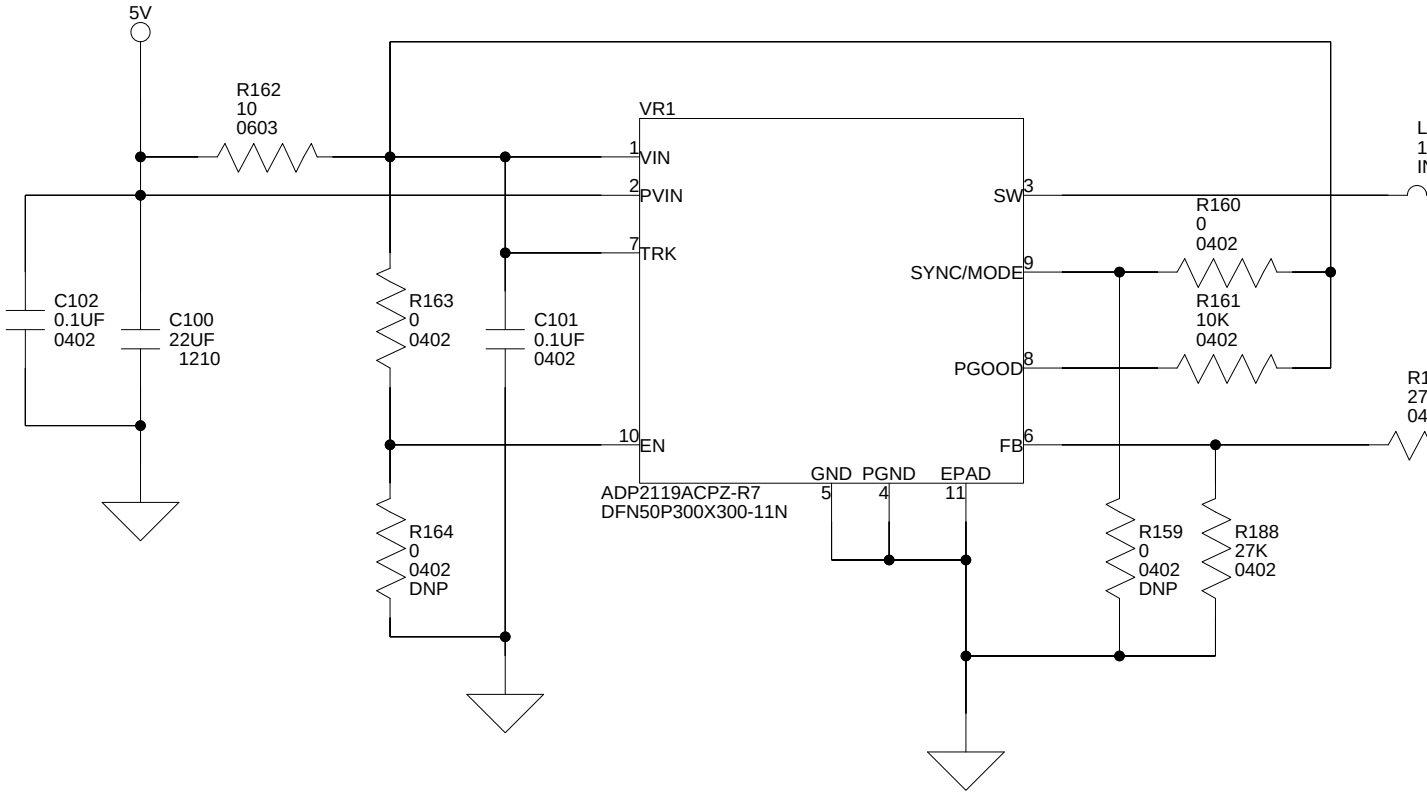
Pins 1

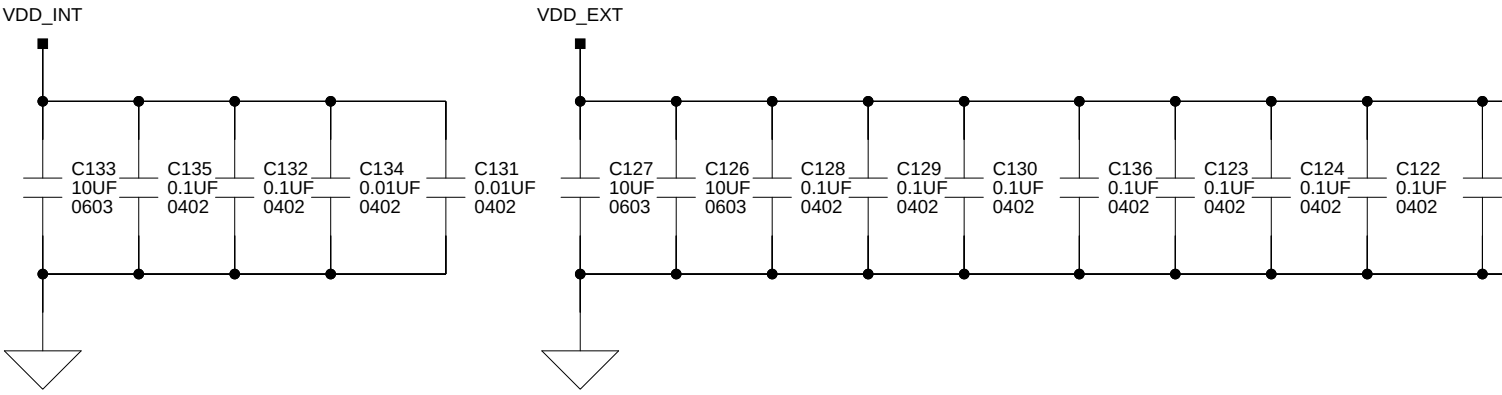


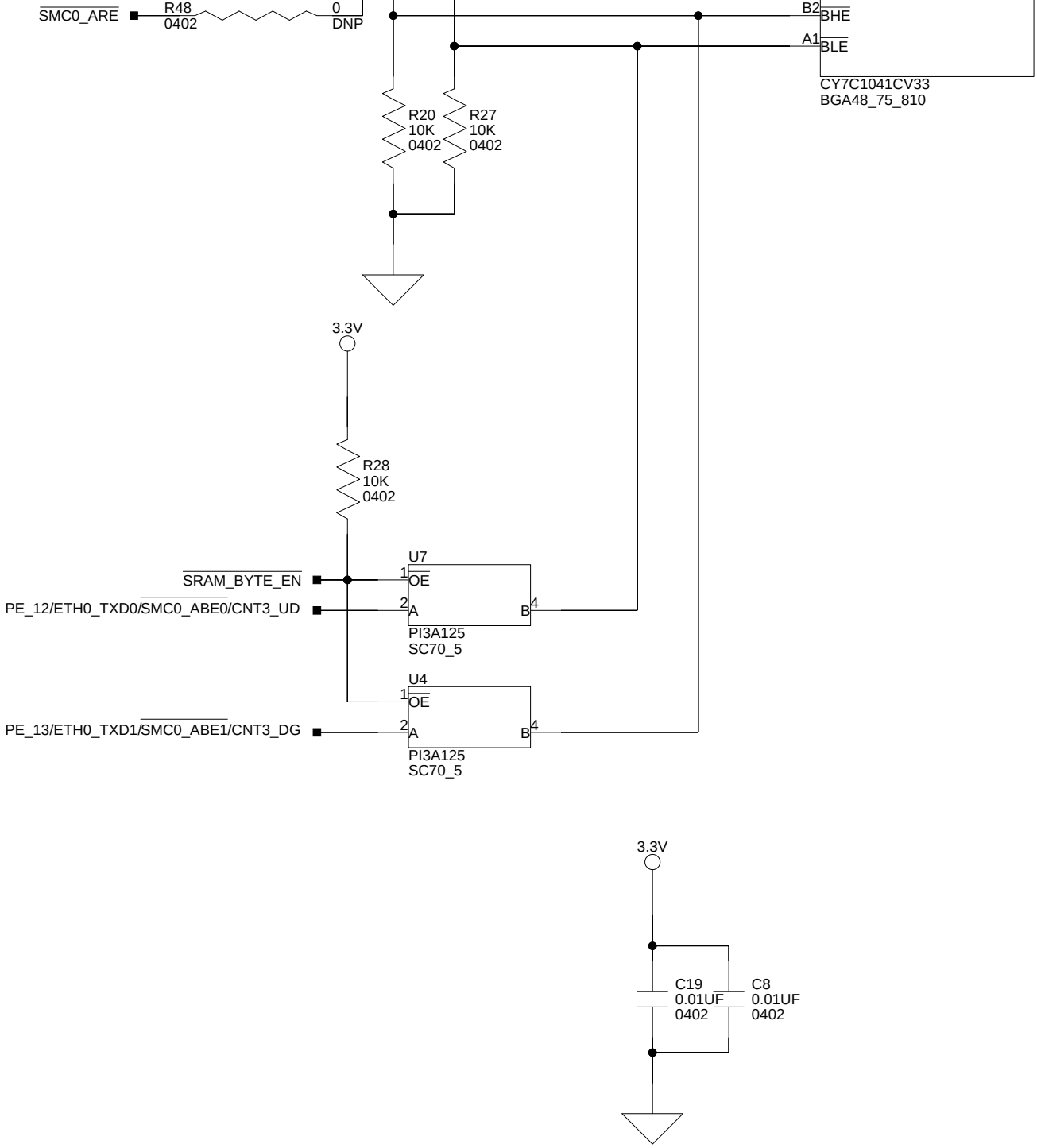
Pins 125-124

NOTE: CONNECT PIN 131 DIRECTLY TO GR
FOR CUSTOMER DESIGNS

1.2V @ 1.5A






SMC0_ARE
R48
0402
0
DNP
B2
BHE
A1
BLE
CY7C1041CV33
BGA48_75_810
R20
10K
0402
R27
10K
0402
3.3V
R28
10K
0402
U7
SRAM_BYTE_EN
OE
PE_12/ETH0_TXD0/SMC0_ABE0/CNT3_UD
A
B
PI3A125
SC70_5
U4
OE
PE_13/ETH0_TXD1/SMC0_ABE1/CNT3_DG
A
B
PI3A125
SC70_5
3.3V
C19
0.01UF
0402
C8
0.01UF
0402

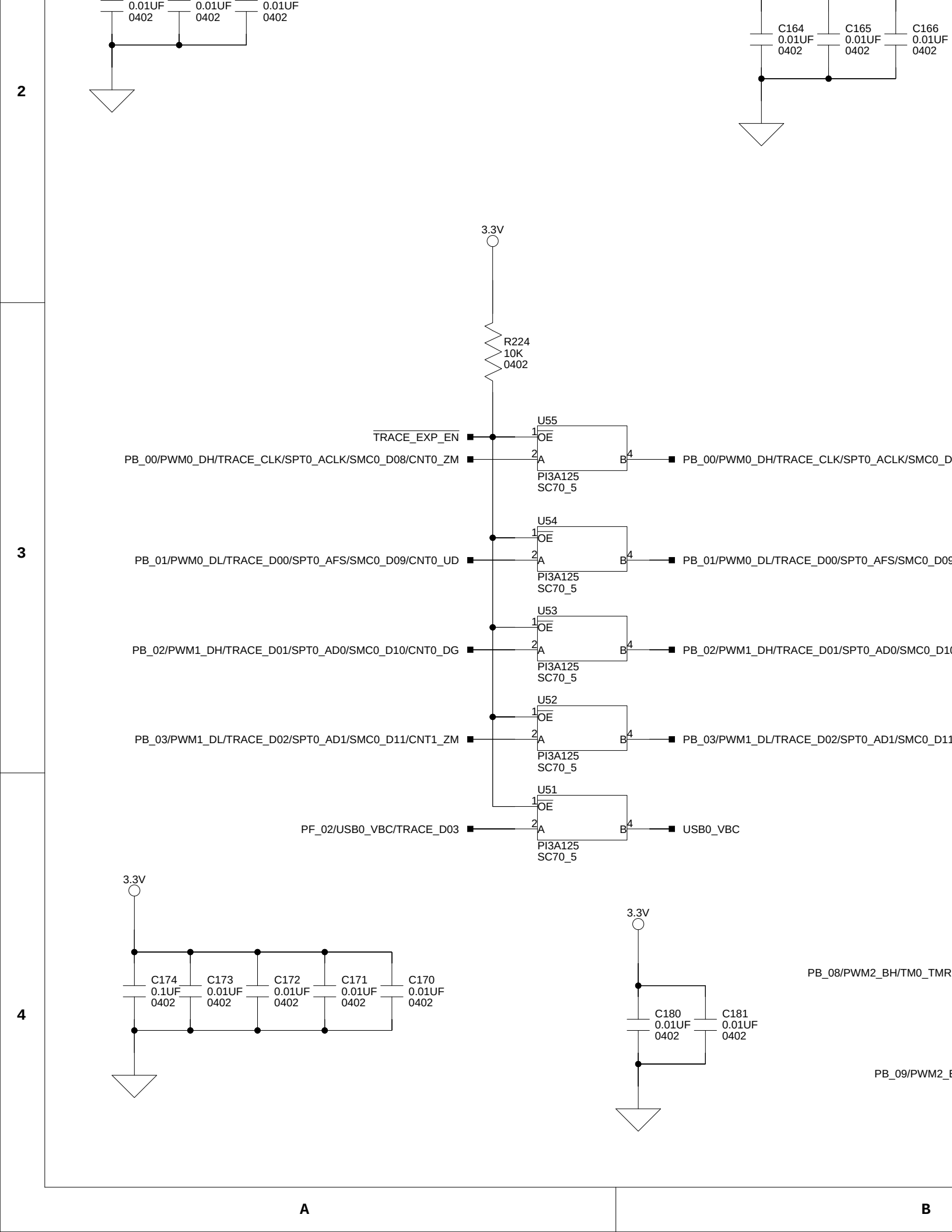
2

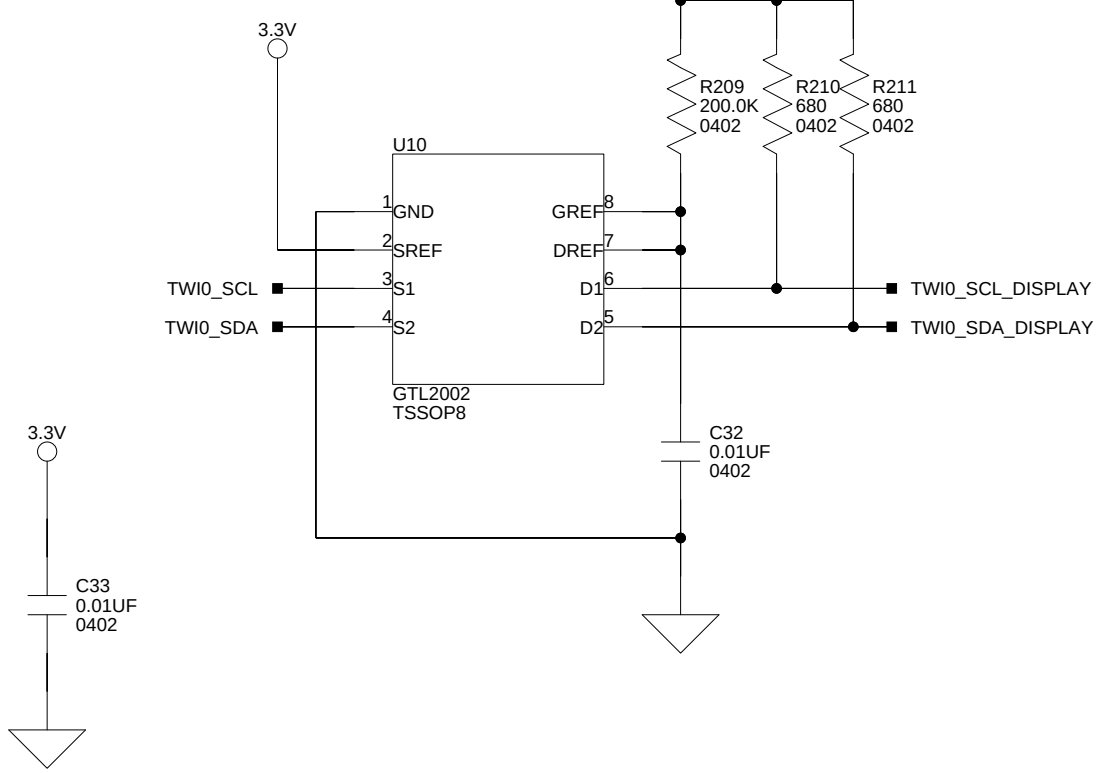
3

4

A

B


0.01UF
0402
0.01UF
0402
0.01UF
0402
C164
0.01UF
0402
C165
0.01UF
0402
C166
0.01UF
0402
3.3V
R224
10K
0402
U55
OE
A
B
PI3A125
SC70_5
TRACE_EXP_EN
PB_00/PWM0_DH/TRACE_CLK/SPT0_ACLK/SMC0_D08/CNT0_ZM
PB_00/PWM0_DH/TRACE_CLK/SPT0_ACLK/SMC0_D
U54
PB_01/PWM0_DL/TRACE_D00/SPT0_AFS/SMC0_D09/CNT0_UD
PB_01/PWM0_DL/TRACE_D00/SPT0_AFS/SMC0_D09
U53
PB_02/PWM1_DH/TRACE_D01/SPT0_AD0/SMC0_D10/CNT0_DG
PB_02/PWM1_DH/TRACE_D01/SPT0_AD0/SMC0_D10
U52
PB_03/PWM1_DL/TRACE_D02/SPT0_AD1/SMC0_D11/CNT1_ZM
PB_03/PWM1_DL/TRACE_D02/SPT0_AD1/SMC0_D11
U51
PF_02/USB0_VBC/TRACE_D03
USB0_VBC
3.3V
C174
0.1UF
0402
C173
0.01UF
0402
C172
0.01UF
0402
C171
0.01UF
0402
C170
0.01UF
0402
3.3V
C180
0.01UF
0402
C181
0.01UF
0402
PB_08/PWM2_BH/TM0_TMR
PB_09/PWM2_B


3.3V
R209
200.0K
0402
R210
680
0402
R211
680
0402
U10
1
GND
2
SREF
3
S1
4
S2
8
GREF
7
DREF
6
D1
5
D2
TWI0_SCL
TWI0_SDA
TWI0_SCL_DISPLAY
TWI0_SDA_DISPLAY
GTL2002
TSSOP8
C32
0.01UF
0402

3.3V
C33
0.01UF
0402

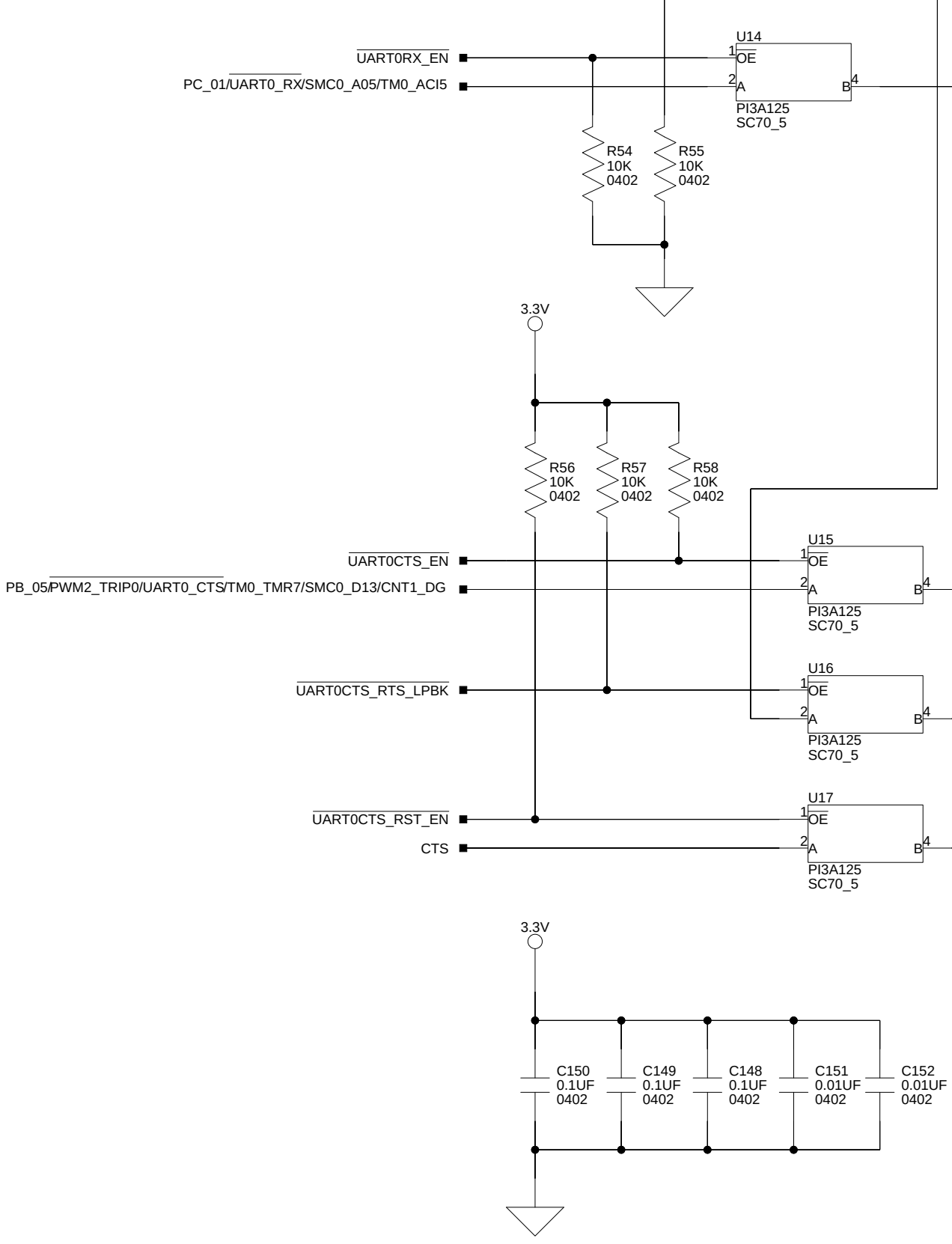
2

3

4

A

B


U14
UART0RX_EN
PC_01/UART0_RX/SMC0_A05/TM0_ACI5
OE
A
B
PI3A125
SC70_5
R54
10K
0402
R55
10K
0402
3.3V
R56
10K
0402
R57
10K
0402
R58
10K
0402
U15
UART0CTS_EN
PB_05/PWM2_TRIP0/UART0_CTS/TM0_TMR7/SMC0_D13/CNT1_DG
U16
UART0CTS_RTS_LPBK
U17
UART0CTS_RST_EN
CTS
C150
0.1UF
0402
C149
0.1UF
0402
C148
0.1UF
0402
C151
0.01UF
0402
C152
0.01UF
0402

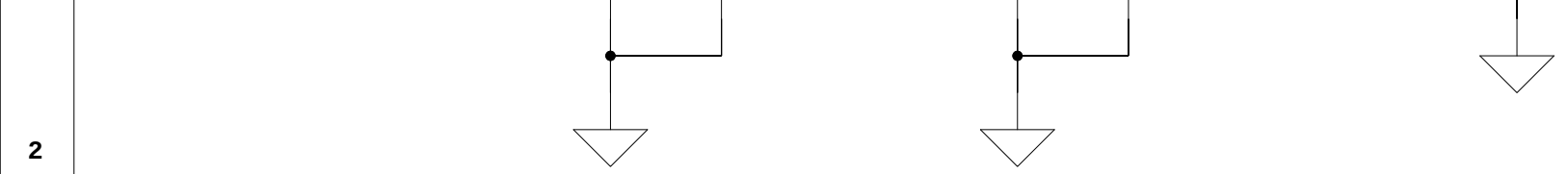
2

3

4

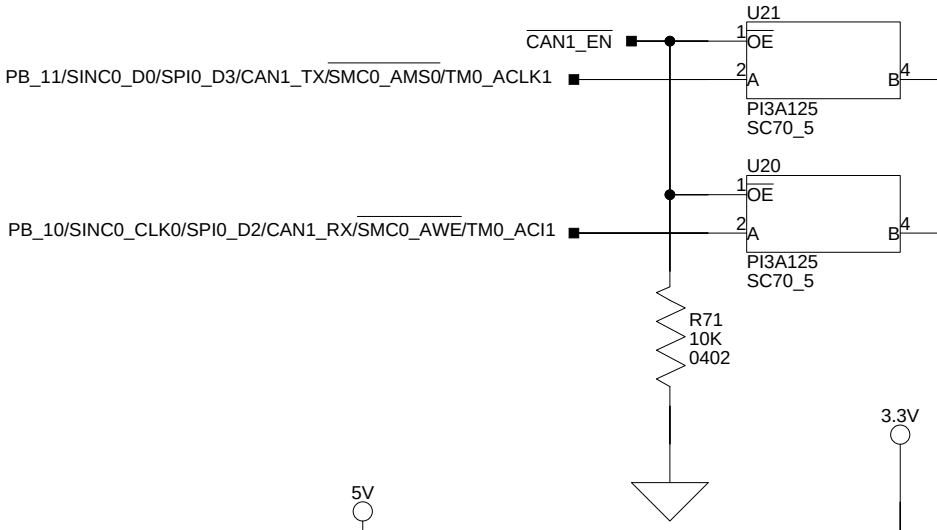
A

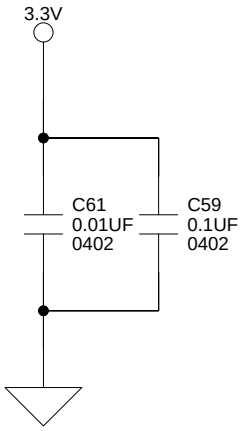
B

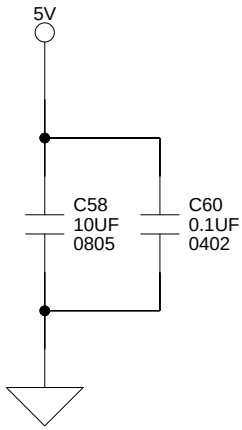


Place between pins 6 and 7

Place between pins 8 and 9

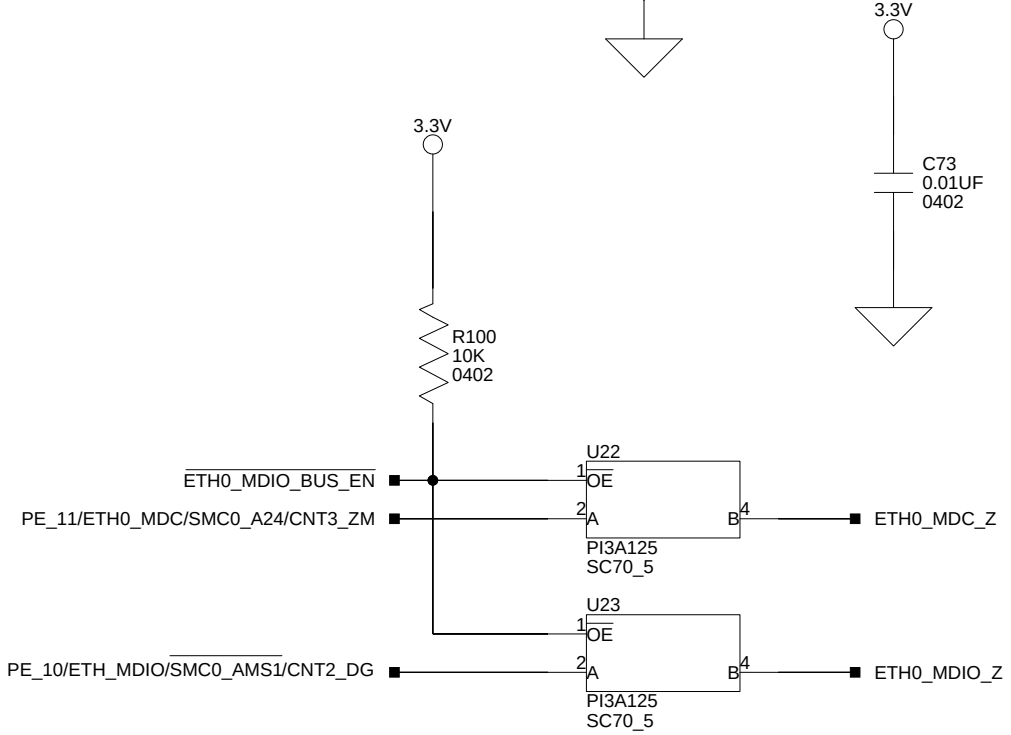


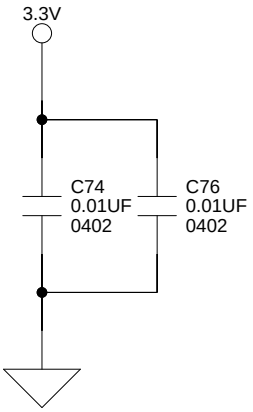


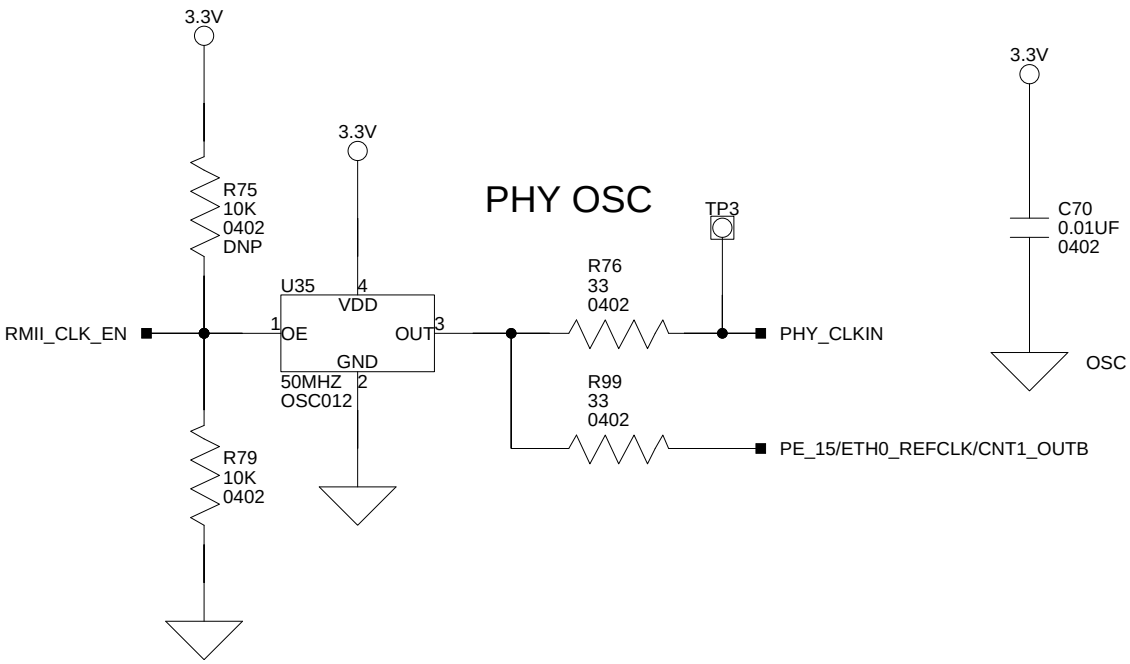


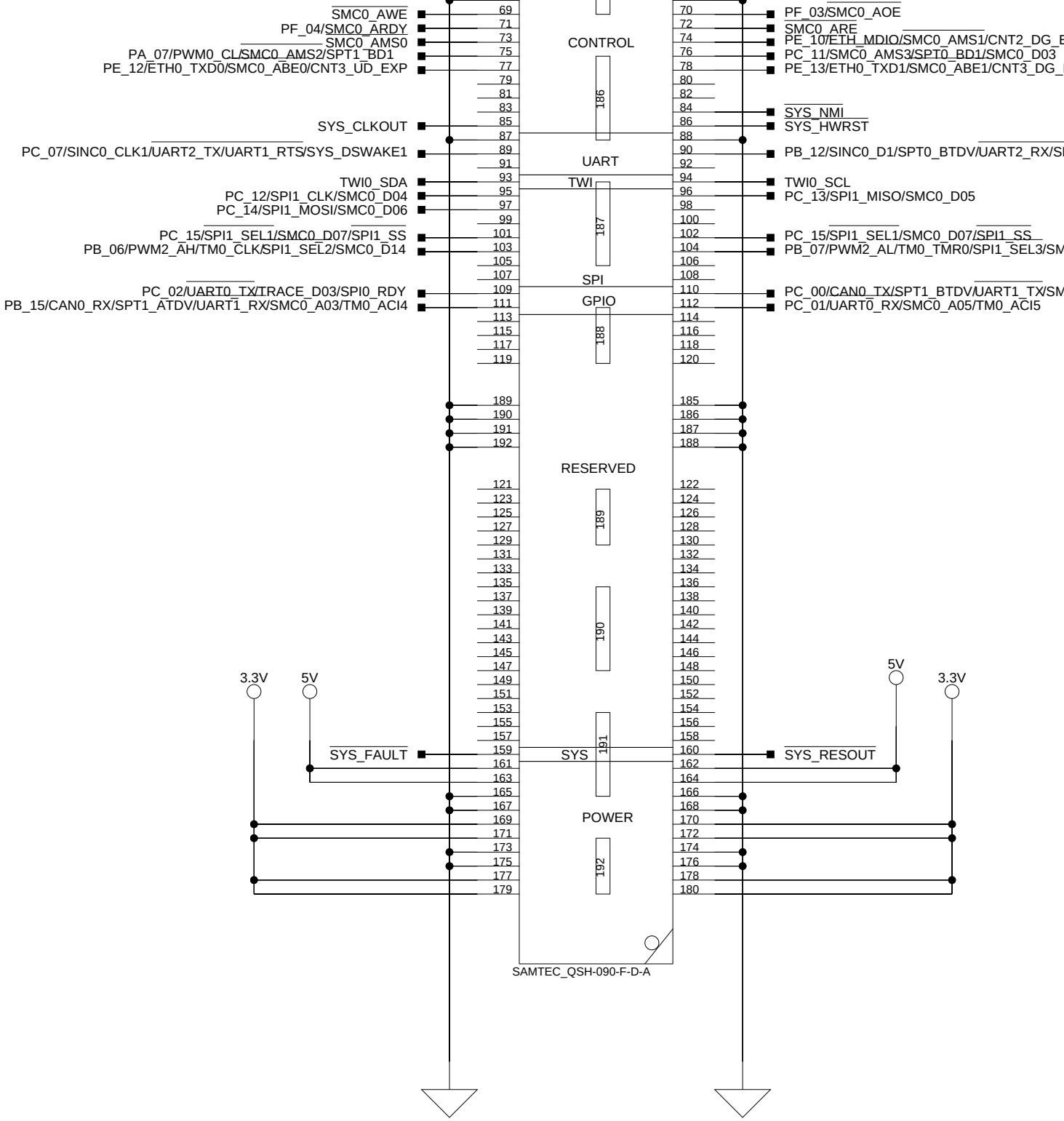
Place between pins 6 and 7

Place between pins 8 and 9

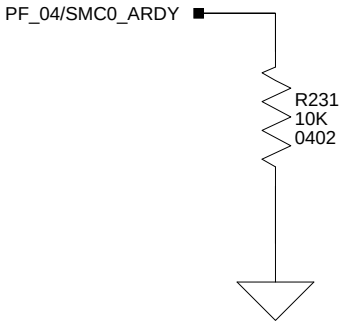

3.3V
C73
0.01UF
0402
3.3V
R100
10K
0402
U22
ETH0_MDIO_BUS_EN
OE
PE_11/ETH0_MDC/SMC0_A24/CNT3_ZM
A
B
ETH0_MDC_Z
PI3A125
SC70_5
U23
OE
PE_10/ETH_MDIO/SMC0_AMS1/CNT2_DG
A
B
ETH0_MDIO_Z
PI3A125
SC70_5

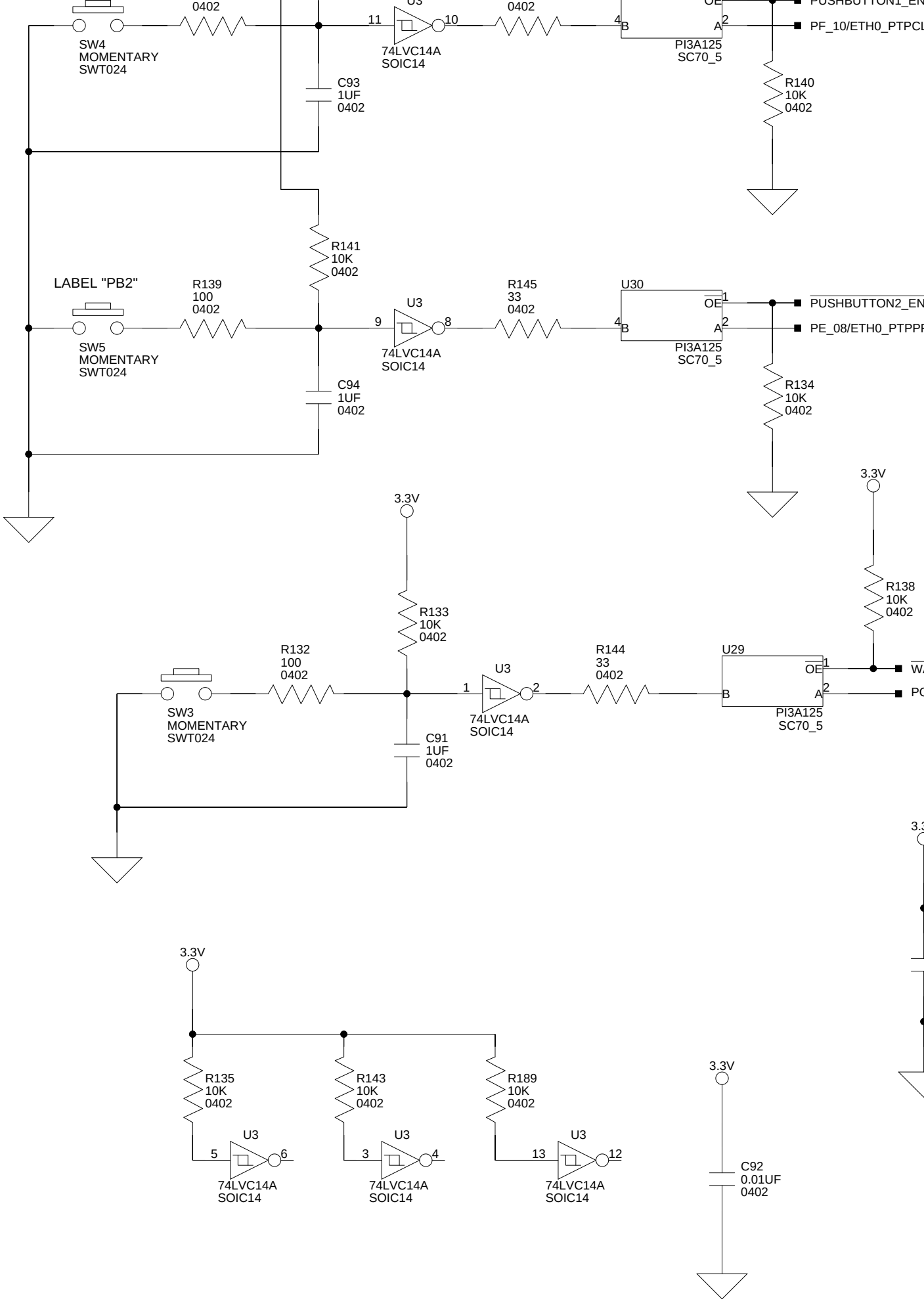

3.3V
C74
0.01UF
0402
C76
0.01UF
0402

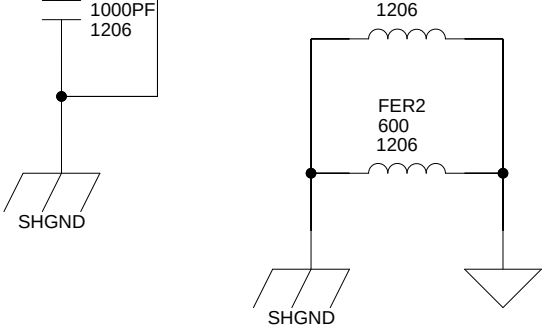

3.3V
3.3V
PHY OSC
R75
10K
0402
DNP
U35
VDD
RMII_CLK_EN
OE
OUT
GND
50MHZ
OSC012
R76
33
0402
TP3
PHY_CLKIN
R99
33
0402
PE_15/ETH0_REFCLK/CNT1_OUTB
R79
10K
0402
3.3V
C70
0.01UF
0402
OSC


SMC0_AWE
PF_04/SMC0_ARDY
SMC0_AMS0
PA_07/PWM0_CL/SMC0_AMS2/SPT1_BD1
PE_12/ETH0_TXD0/SMC0_ABE0/CNT3_UD_EXP
SYS_CLKOUT
PC_07/SINC0_CLK1/UART2_TX/UART1_RTS/SYS_DSWAKE1
TWI0_SDA
PC_12/SPI1_CLK/SMC0_D04
PC_14/SPI1_MOSI/SMC0_D06
PC_15/SPI1_SEL1/SMC0_D07/SPI1_SS
PB_06/PWM2_AH/TM0_CLK/SPI1_SEL2/SMC0_D14
PC_02/UART0_TX/TRACE_D03/SPI0_RDY
PB_15/CAN0_RX/SPT1_ATDV/UART1_RX/SMC0_A03/TM0_ACI4
CONTROL
UART
TWI
SPI
GPIO
RESERVED
SYS
POWER
186
187
188
189
190
191
192
PF_03/SMC0_AOE
SMC0_ARE
PE_10/ETH_MDIO/SMC0_AMS1/CNT2_DG_E
PC_11/SMC0_AMS3/SPT0_BD1/SMC0_D03
PE_13/ETH0_TXD1/SMC0_ABE1/CNT3_DG_
SYS_NMI
SYS_HWRST
PB_12/SINC0_D1/SPT0_BTDV/UART2_RX/SI
TWI0_SCL
PC_13/SPI1_MISO/SMC0_D05
PC_15/SPI1_SEL1/SMC0_D07/SPI1_SS
PB_07/PWM2_AL/TM0_TMR0/SPI1_SEL3/SM
PC_00/CAN0_TX/SPT1_BTDV/UART1_TX/SM
PC_01/UART0_RX/SMC0_A05/TM0_ACI5
3.3V
5V
SYS_FAULT
SYS_RESOUT
SAMTEC_QSH-090-F-D-A

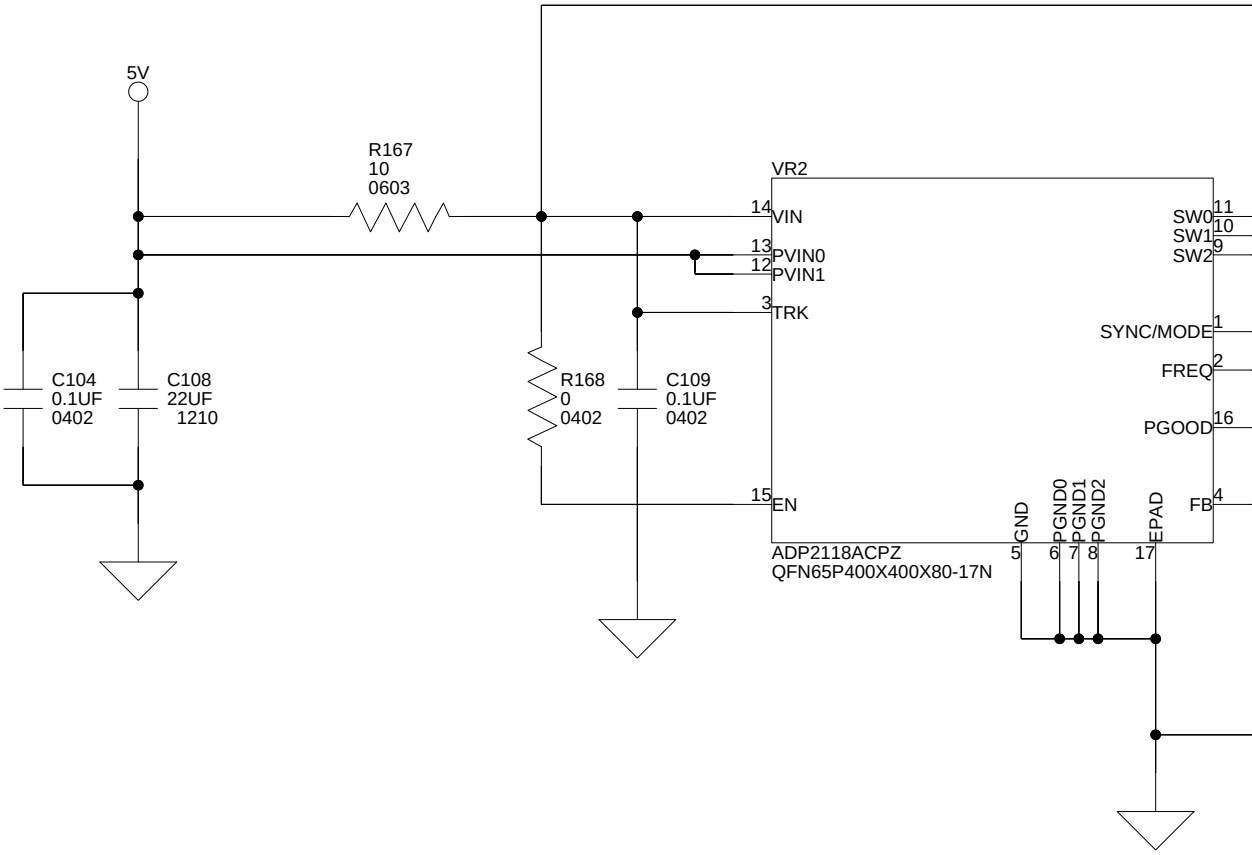
ASYNCH CONN


PF_04/SMC0_ARDY
R231
10K
0402


0402
SW4
MOMENTARY
SWT024
U3
11
10
74LVC14A
SOIC14
0402
4
B
OE
A
2
PI3A125
SC70_5
PUSHBUTTON1_EN
PF_10/ETH0_PTPCL
C93
1UF
0402
R140
10K
0402
R141
10K
0402
LABEL "PB2"
R139
100
0402
SW5
MOMENTARY
SWT024
U3
9
8
74LVC14A
SOIC14
R145
33
0402
U30
OE
1
B
4
A
2
PI3A125
SC70_5
PUSHBUTTON2_EN
PE_08/ETH0_PTPPF
C94
1UF
0402
R134
10K
0402
3.3V
R138
10K
0402
R133
10K
0402
R132
100
0402
SW3
MOMENTARY
SWT024
U3
1
2
74LVC14A
SOIC14
R144
33
0402
U29
OE
1
B
A
2
PI3A125
SC70_5
C91
1UF
0402
3.3V
R135
10K
0402
R143
10K
0402
R189
10K
0402
U3
5
6
74LVC14A
SOIC14
U3
3
4
74LVC14A
SOIC14
U3
13
12
74LVC14A
SOIC14
3.3V
C92
0.01UF
0402


1000PF
1206
SHGND
1206
FER2
600
1206
SHGND

3.3V @ 2A


5V
R167
10
0603
VR2
14 VIN
13 PVIN0
12 PVIN1
3 TRK
15 EN
SW0 11
SW1 10
SW2 9
SYNC/MODE 1
FREQ 2
PGOOD 16
FB 4
GND 5
PGND0 6
PGND1 7
PGND2 8
EPAD 17
ADP2118ACPZ
QFN65P400X400X80-17N
C104
0.1UF
0402
C108
22UF
1210
R168
0
0402
C109
0.1UF
0402

I INDEX

A

ADSP-CM408F processor, x
analog connector (J9), 2-26
architecture, of this EZ-KIT Lite, 2-2
asynch or memory connector (J4), 2-24

B

bill of materials, A-1
board schematic (ADSP-CM408F), B-1
bus switch, 2-5
  example, 2-6

C

CAN0 connector (J7), 2-25
CAN1 connector (J8), 2-26
character display connector (J5), 2-25
configuration, of this EZ-KIT Lite, 1-3
connectors, 2-23
  diagram of locations, 2-23
  J1 (ethernet), 2-24
  J2 (RS-485), 2-24
  J3 (DCE UART), 2-24
  J4 (asynch or memory), 2-24
  J5 (character display), 2-25
  J6 (PWM), 2-25
  J7 (CAN0), 2-25
  J8 (CAN1), 2-26
  J9 (analog), 2-26

connectors *(continued)*
  P10 (VREF buffered), 2-27
  P1 (JTAG/SWD/SWV), 2-26
  P2 (RACE and JTAG/SWD), 2-26
  P3 (USB), 2-27
  P8 (IEEE 1588), 2-27
  P9 (power), 2-27
contents, of this EZ-KIT Lite package, 1-2

D

DCE UART connector (J3), 2-24
debug interface, 1-13
default configuration, of this EZ-KIT Lite, 1-3
default jumper and switch settings, 1-4
default processor interface availability, 2-7
design reference information, 1-16

E

EngineerZone, xviii
ethernet connector (J1), 2-24
ethernet interface, 1-12
ethernet speed LED (LED6), 2-21
example programs, 1-16
expansion interface, 1-14

F

FET switches, 2-4
  example, 2-4

Index

G

general-purpose I/O pins (GPIO), 2-21

I

IEEE 1588 (P8), 2-27
installation, of this EZ-KIT Lite, 1-4, 1-5

J

JTAG/SWD/SWV connector (P1), 2-26
jumpers
  diagram of locations, 2-17

L

LEDs, 2-20
  diagram of locations, 2-20
  LED1-4 (GPIO), 2-21
  LED5 (reset), 2-21
  LED6 (ethernet speed), 2-21
  LED7 (power), 2-22
  LED8 (SYS_FAULT), 2-22

M

mechanical switch, 2-5, 2-7

N

notation conventions, xviii

P

package contents, 1-2
power
  architecture, 1-15
  LED (LED7), 2-22
  measurements, 1-15
power connector (P9), 2-27
power-on-self test (POST), 1-14
product overview, x
programming SoftConfig switches, 2-8
push buttons and switches, 2-15
PWM connector (J6), 2-25

R

reset LED (LED5), 2-21
RS-485 connector (J2), 2-24

S

schematic, of ADSP-CM408F EZ-KIT Lite, B-1
serial liquid crystal display module interface, 1-13
SoftConfig
  on the EZ-KIT Lite, 2-7, 2-10
  overview, 2-3
  programming switches, 2-8
SRAM memory (U2), 1-8
supported tools, xvii
switches
  programming SoftConfig, 2-8
switches, diagram of locations, 2-15
SYS_FAULT LED (LED8), 2-22
system architecture, of this EZ-KIT Lite, 2-2

T

technical support, xvi
TRACE and JTAG/SWD connector (P2), 2-26

U

USB connector (P3), 2-27

V

VREF buffered connector (P10), 2-27

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