BB15L61A
Small Signal Sensor
BBS Kit
User Guide

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Table of Contents

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the BB15L61A Small Signal Sensor BBS Kit. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the BB15L61A Small Signal Sensor BBS Kit to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – This chapter describes the most important features of the BB15L61A Small Signal Sensor BBS Kit as well as the contents of the kit and a step-by-step Quick Start Guide.
- **Chapter 2. "Installation and Operation"** – This chapter provides technical details important for the operation of the BB15L61A Small Signal Sensor BBS Kit.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the BB15L61A Small Signal Sensor BBS Kit.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the BB15L61A Small Signal Sensor BBS Kit.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, Italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use the BB15L61A Small Signal Sensor BBS Kit. The following Microchip documents are available and recommended as a supplemental reference resource.

- **AN3183 Application Note – *"Weight Scale Application using MCP3564 24-Bit Delta-Sigma ADC"* (DS00003183)**
- **AN981 Application Note – *"Interfacing a MCP9700 Analog Output Temperature Sensor to a PICmicro"* (AN981)**
- **AN990 Application Note – *"Analog Sensor Conditioning Circuits - An Overview"* (AN990)**
- **AN695 Application Note – *"Interfacing Pressure Sensors to Microchip's Analog Peripherals"* (DS00695)**
- **AN1494 Application Note – *"Using MCP6491 Op Amps for Photodetection Applications"* (DS01494)**

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
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- Local Sales Office
- Embedded System Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the website at:
https://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (February 2026)

- Initial release of this document.

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the BB15L61A Small Signal Sensor Building Block Solution (BBS) Kit and covers the following topics:

- Small Signal Sensor Building Block Solution (BBS) Kit Overview
- Small Signal Sensor Building Block Solution (BBS) Kit Features
- What does the Small Signal Sensor Building Block Solution (BBS) Kit include?

1.2 WHAT IS THE SMALL SIGNAL SENSOR BBS KIT?

The BB15L61A Small Signal Sensor Building Block Solution (BBS) Kit contains several analog and mixed signal devices configured in separate BBS boards for easy evaluation and implementation in system level applications.

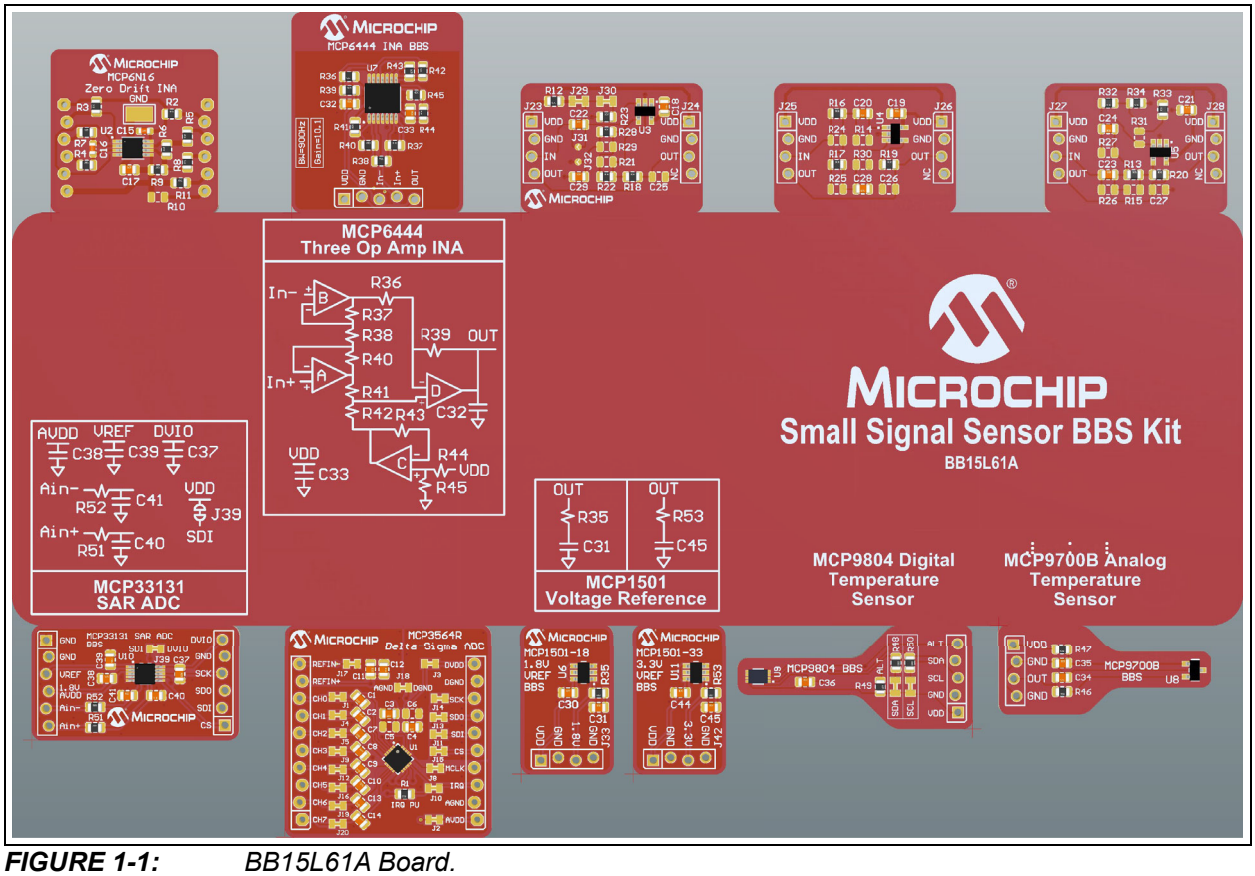


FIGURE 1-1: *BB15L61A Board.*

1.3 WHAT DOES THE SMALL SIGNAL SENSOR BBS KIT INCLUDE?

BB15L61A Small Signal Sensor Building Block Solution (BBS) Kit features the following BBS boards:

Product Description
MCP3564R - 8-Channel, 153.6 ksps, Low Noise 24-Bit Delta-Sigma ADC with Internal Voltage Reference
MCP33131-10 - 1 Msps 16-Bit Single-Ended Input SAR ADC
MCP9804 - ±0.25°C Typical Accuracy Digital Temperature Sensor
MCP9700B - Low-Power Linear Active Thermistor
MCP6444 - 450 nA, 9 kHz Op Amp Configured as a Three Op-Amp INA
MCP6N16 - Zero-Drift Instrumentation Amplifier
MCP6481/MCP6491 - 4/7.5 MHz, Low-Input Bias Current Op Amps, Configured as an amplifier, low pass filter, and high pass filter
MCP1501-33 - 3.3V High-Precision Buffered Voltage Reference
MCP1501-18 - 1.8V High-Precision Buffered Voltage Reference

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The BB15L61A Small Signal Sensor Building Block Solution (BBS) Kit provides a modular platform that allows users to seamlessly integrate individual boards into existing systems or configure multiple boards for diverse application requirements. This flexibility enables rapid prototyping, system expansion and customized solutions for various applications.

Items discussed in this chapter include:

- Getting started
- Each board functional description
- Possible configurations

2.2 GETTING STARTED

This section describes how to power up and interface the BB15L61A Small Signal Sensor Building Block Solution (BBS) Kit.

2.2.1 Hardware Setup

The BB15L61A Small Signal Sensor Building Block Solution (BBS) Kit requires additional components and instrumentation for proper operation and testing.

- Header pins (not included) are necessary for connectivity.
- Power supply, oscilloscope and function generator are recommended to provide power, signal generation and data acquisition capabilities.

Depending on the specific application, some or all of these components and tools may be required in combination.

2.3 FUNCTIONAL DESCRIPTION

2.3.1 MCP3564R 24-bit Delta-Sigma ADC

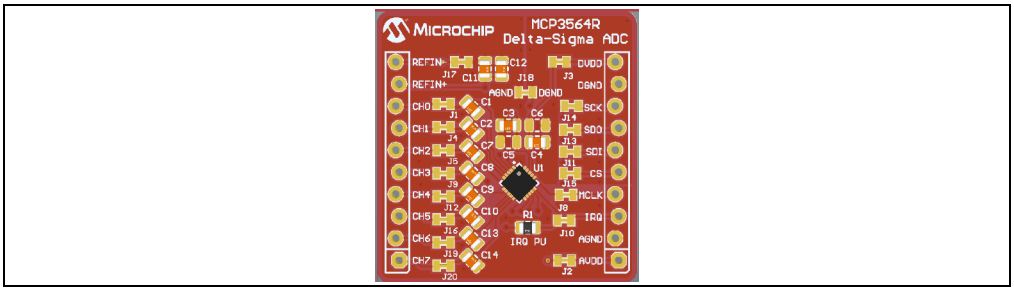


FIGURE 2-1: *MCP3564R Delta-Sigma ADC BBS Board.*

This board breaks out the MCP3564R 8-channel, 24-bit 153.6ksps Delta-Sigma ADC with internal voltage reference, oscillator, temperature sensor, and burnout sensor detection. The MCP3564R has extensive software and firmware examples, APIs, evaluation board, and a weight-scale reference design for easy integration. Look under Documentation on the product webpage for the various collateral.

- MCP3564R Product Webpage
- MCP3564R Collateral

2.3.2 MCP33131-10 16-bit SAR ADC

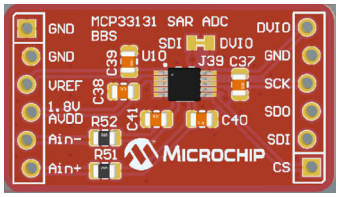


FIGURE 2-2: *MCP33131 SAR ADC BBS Board.*

This board showcases the MCP33131-10, a 1 Msps, 16-bit single-ended input SAR ADC which features low power consumption (0.8 µA typical standby, 1.6 mA typical active). Applications for the MCP33131-10 include high-precision data acquisition, medical instrumentation, motor control applications, electric vehicle battery management systems, battery operated applications, switch- mode power supply applications. The MCP33131-10 has a generic C API to help support easy implementation in an embedded system.

- MCP33131-10 Product Webpage
- MCP33131-10 Collateral

2.3.3 MCP9804 Digital Temperature Sensor

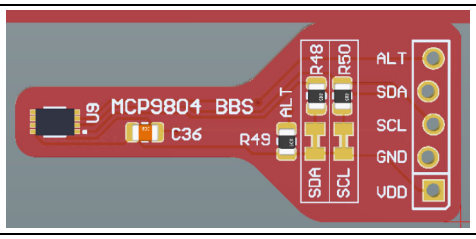


FIGURE 2-3: *MCP9804 Digital Temperature Sensor BBS Board.*

The MCP9804 is a digital temperature sensor with a ±0.25°C typical, ±1°C maximum accuracy from -40°C to +125°C. It uses I2C/SMBus communication protocol, and its address is 0x18. See Register 5-4 in the data sheet for information about the ambient temperature register.

- MCP9804 Product Webpage
- MCP9804 Collateral

2.3.4 MCP9700B Analog Temperature Sensor

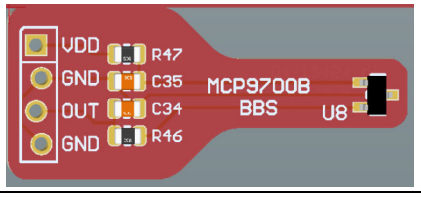


FIGURE 2-4: *MCP9700B Analog Temperature Sensor BBS Board.*

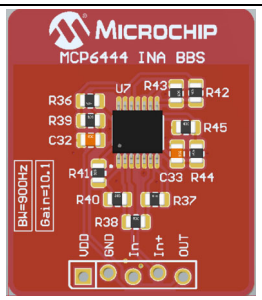
The MCP9700B is an analog output temperature sensor that converts temperature to an analog voltage between 0V and V_{DD}. With a 12-bit ADC and 4.096V reference, the MCP9700B will output 0.1°C/bit according to Equation 2-1.

EQUATION 2-1:

$$Temperature\ (\,^{\circ}C) = \frac{OUT - 500\ mV}{10\ mV/^{\circ}C}$$

- MCP9700B Product Webpage
- MCP9700B Collateral

2.3.5 MCP6444 Three Op-Amp INA



Note: The In- and In+ silk screens are swapped and should be seen a above.

FIGURE 2-5: *MCP6444 Three Op-Amp INA BBS Board.*

This three op-amp INA has a bandwidth of 891 Hz and a gain of 10.1. See Equation 2-2 for gain and bandwidth, and change R38, R40, R41 and R42 accordingly for different gains. The gain-bandwidth product of the MCP6444 is 9000 Hz. This circuit is useful for low-power, precision applications due to the low power consumption of the MCP6444 (450 nA typical per amplifier). On the Small Signal Sensor Kit Board product webpage is provided is a Mindi circuit simulation of this BBS board called “MCP6444 INA.sxsch”.

EQUATION 2-2:

$$Gain = \frac{R_{42}}{R_{41}} \times \left(1 + 2 \times \frac{R_{40}}{R_{38}}\right) = \frac{100k}{100k} \times \left(1 + 2 \times \frac{100k}{22k}\right) = 10.1$$

$$BW = \frac{9000}{Gain} = 891$$

- MCP6444 Product Webpage
- MCP6444 Collateral

2.3.6 MCP6N16 Zero-Drift INA

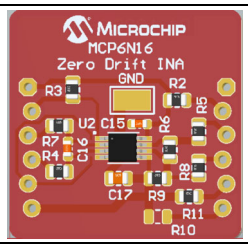


FIGURE 2-6: *MCP6N16 Zero-Drift INA BBS Board.*

This BBS board uses the MCP6N16 zero drift instrumentation amplifier. It has a typical offset voltage of 17 µV and a temperature coefficient of 60 nV/°C. On the Small Signal Sensor Kit Board product webpage is provided a Mindi circuit simulation of this BBS board called MCP6N16.sxsch. This board is set up to have a gain of 100 as seen by Equation 2-3.

EQUATION 2-3:

$$Gain = \frac{R_6}{R_9} = \frac{100k}{1k} = 100$$

- MCP6N16 Product Webpage
- MCP6N16 Collateral

2.3.7 MCP6481/MCP6491 Amplifier, LPF and HPF

This three-in-one set of boards contains a noninverting amplifier with a gain of 50, a low pass filter with a cut off frequency of 21.6k Hzx and a high pass filter with a cut off frequency of 30 Hz. Any combination of two boards (amplifier + low pass filter, amplifier + high pass filter, or low pass filter + high pass filter) or all three boards can be connected in series without any wires as shown in 13 and 14. On the Small Signal Sensor Kit Board product webpage is provided a Mindi circuit simulation of all three of these BBS boards called BB61S86A.sxsch. For more help designing filters, visit Microchip's FilterLab tool at filterlab.microchip.com.

Amplifier

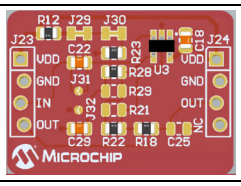


FIGURE 2-7: *MCP6491 Noninverting Amplifier BBS Board.*

EQUATION 2-4:

$$Gain = \frac{R_{22}}{R_{10}} + 1 = \frac{487k}{10k} + 1 = 49.7$$

Low Pass Filter

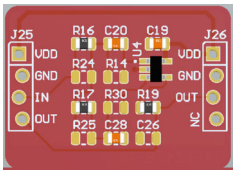


FIGURE 2-8: *MCP6481 Low Pass Filter BBS Board.*

EQUATION 2-5:

Cutoff Frequency: 21.6 kHz

$$f_c = \frac{1}{2 \times \pi \times \sqrt{R_{16} R_{17} C_{20} C_{28}}}$$

High Pass Filter

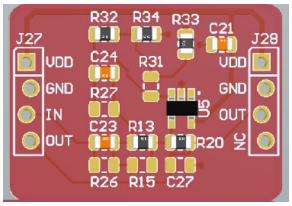


FIGURE 2-9: *MCP6481 High Pass Filter BBS Board.*

EQUATION 2-6:

Cutoff Frequency: 30 kHz

$$f_c = \frac{1}{2 \times \pi \times \sqrt{R_{13} R_{32} C_{23} C_{24}}}$$

- MCP6481 Product Webpage
- MCP6481 Collateral
- MCP6491 Product Webpage
- MCP6491 Collateral

2.3.8 MCP1501 – Voltage Reference

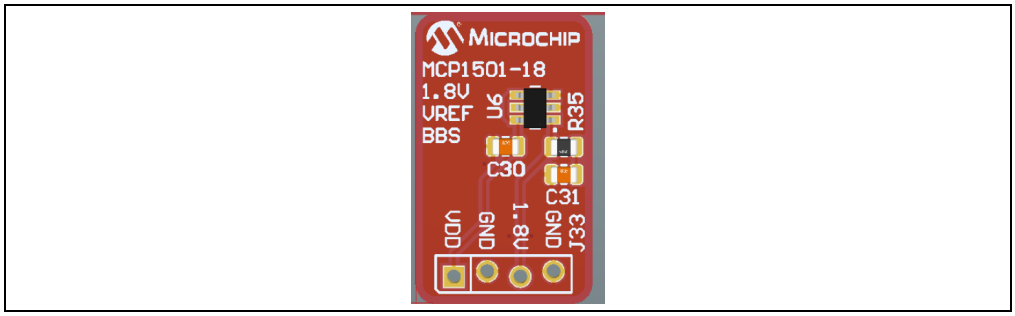


FIGURE 2-10: *MCP1501 V_{REF} BBS Board.*

This board outputs a high-precision, buffered reference voltage (1.8V or 3.3V depending on the board) capable of sinking and sourcing 20 mA of current.

- MCP1501 Product Webpage
- MCP1501 Collateral

2.4 POSSIBLE CONFIGURATIONS

2.4.1 Amplifier, Low Pass Filter and High Pass Filter all in Series

The BB61S86A can be conveniently configured to attach the amplifier, low pass filter, and high pass filter all in series without a breadboard, simply by connecting the header on the right side of the board to the left side of the other board like this.

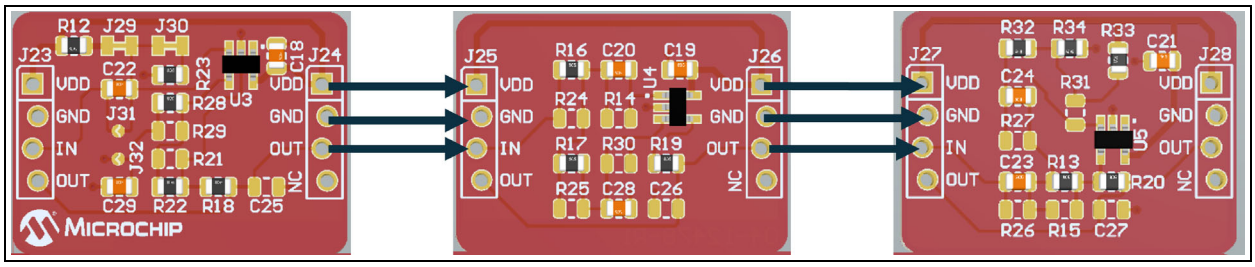


FIGURE 2-11: *Amplifier + LPF + HPF.*

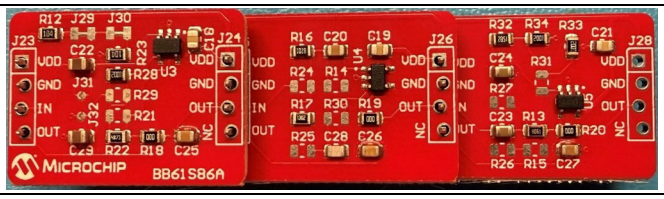


FIGURE 2-12: *Amplifier + LPF + HPF (Top View).*

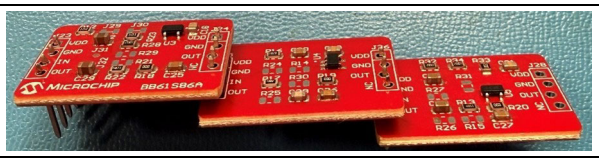


FIGURE 2-13: *Amplifier + LPF + HPF (Side View).*

This approach can be used to connect two or more boards together in any desired configuration.

2.4.2 High-Precision, Buffered Reference Voltage

This board outputs a high-precision, buffered reference voltage (1.8V or 3.3V depending on the board) capable of sinking and sourcing 20 mA of current. The MCP1501-18 1.8V reference voltage BBS board is useful for supplying a stable, high precision reference voltage for the 1.8V AV_{DD} pin on the MCP33131-10 SAR ADC BBS Board. On the Small Signal Sensor Kit Board product webpage is provided is a Mindi circuit simulation of this BBS board called MCP1501-33.sxsch.

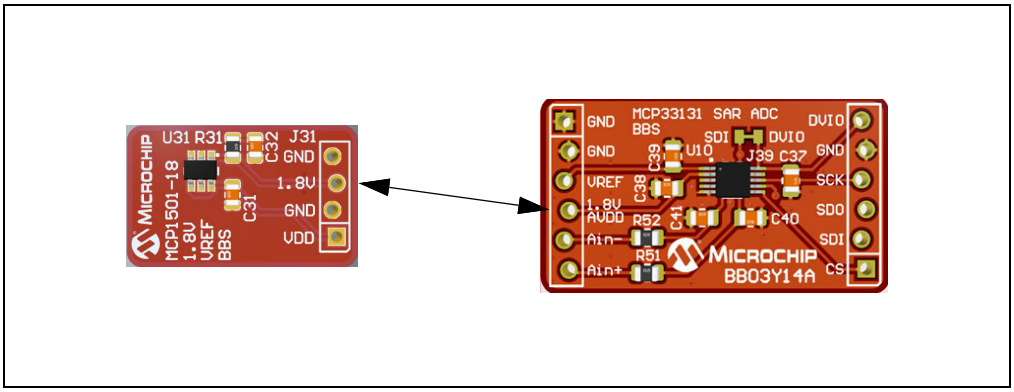


FIGURE 2-14: *V_{REF} + SAR ADC.*

2.4.3 Wheatstone Bridge or Load Cell Application

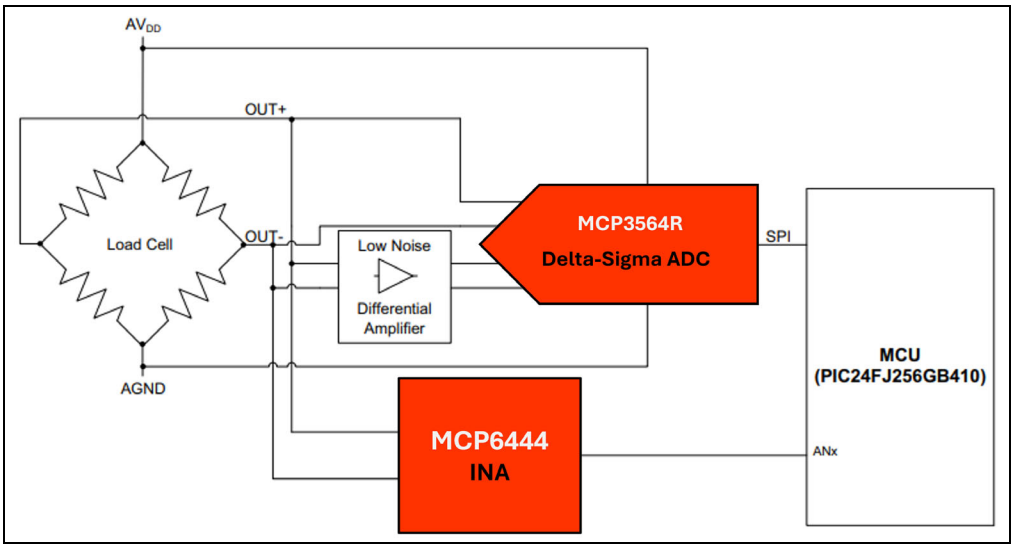


FIGURE 2-15: *MCP3564R Delta-Sigma ADC + Instrumentation Amplifier + MCU.*

2.4.4 Thermocouple Reference Design

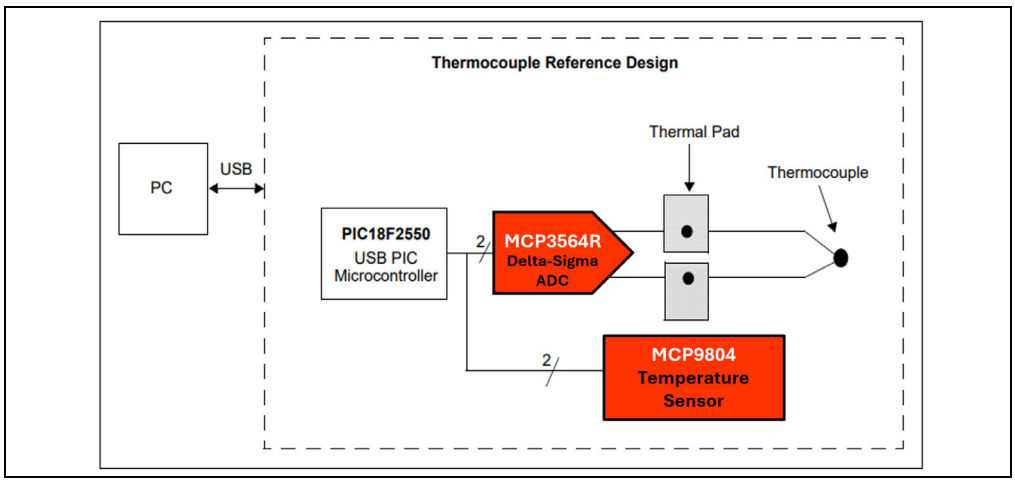


FIGURE 2-16: *MCP9804 + MCP3564R Delta-Sigma ADC + MCU.*

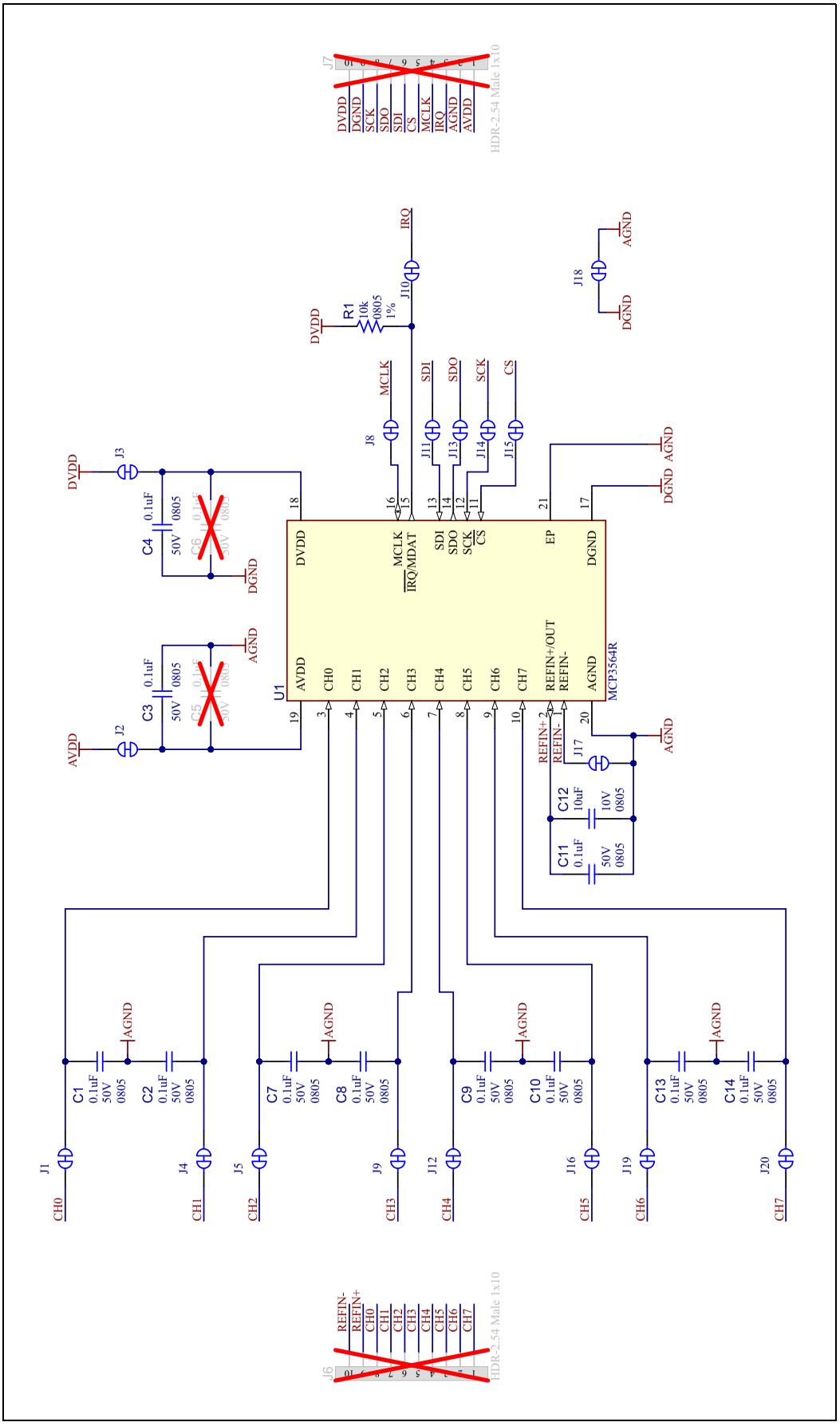
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

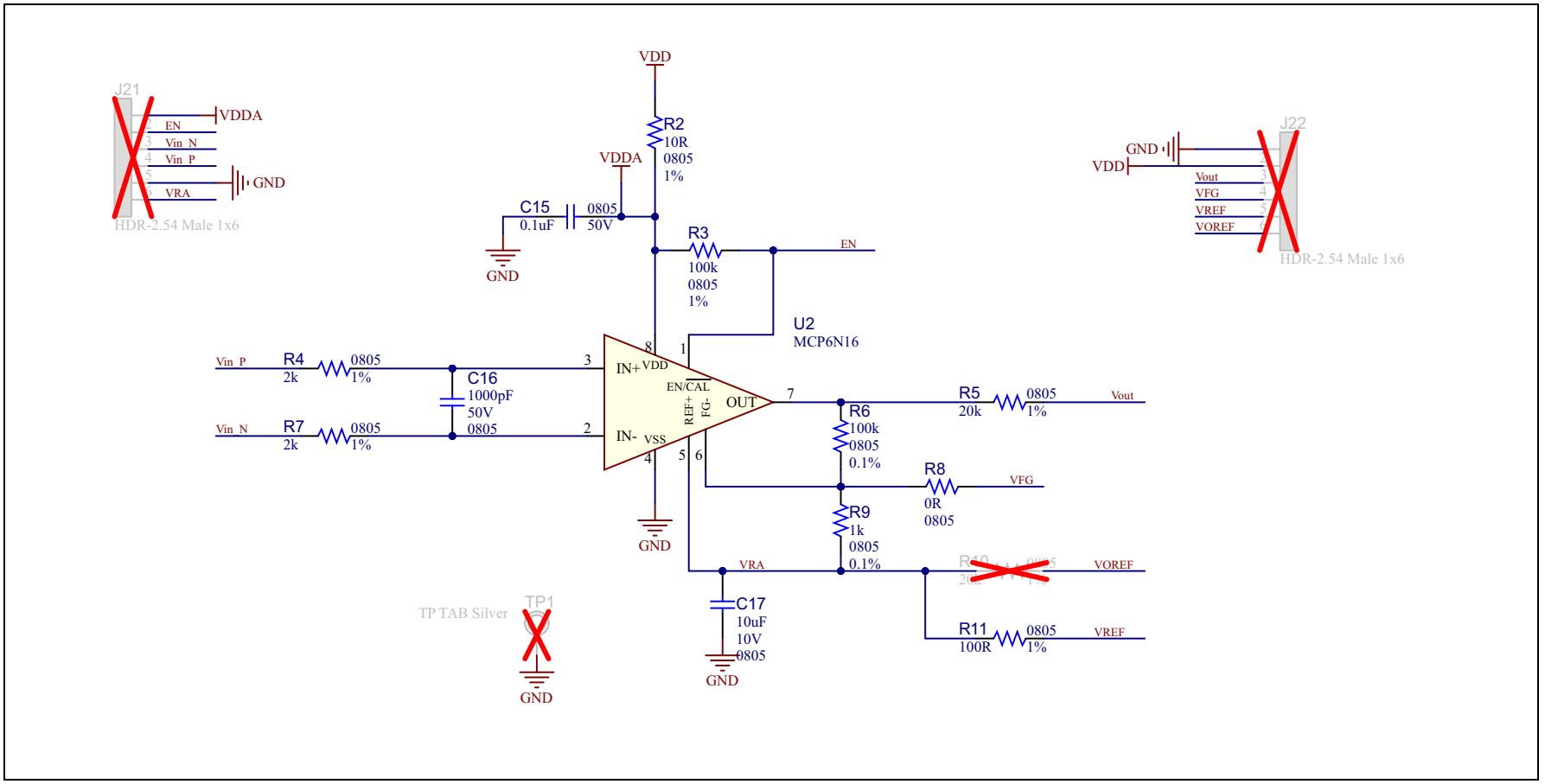
This appendix contains the following schematics and layouts for the BB15L61A Small Signal Sensor BBS Kit:

- Board – Schematic 1
- Board – Schematic 2
- Board – Schematic 3
- Board – Schematic 4
- Board – Schematic 5
- Board – Schematic 6
- Board – Schematic 7
- Board – Schematic 8
- Board – Schematic 9
- Board – Top Silk
- Board – Top Copper and Silk
- Board – Top Copper
- Board – Bottom Copper
- Board – Bottom Copper and Silk
- Board – Bottom Silk

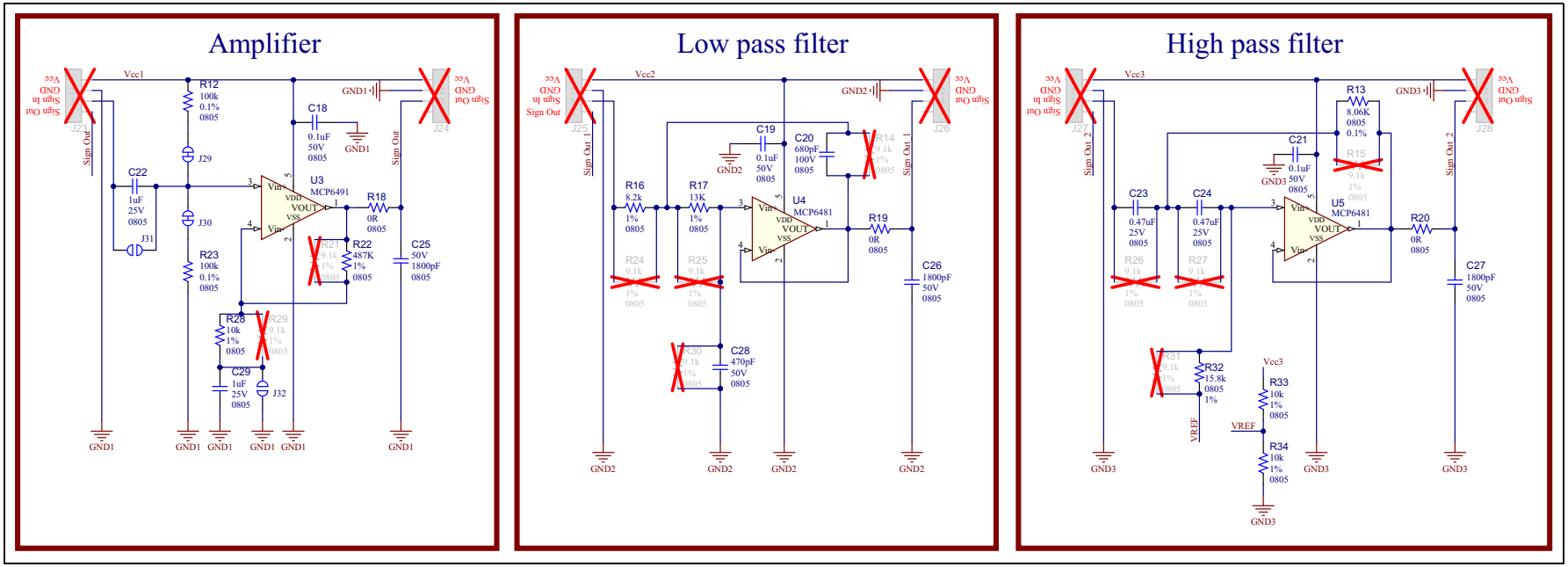
A.2 BOARD – SCHEMATIC 1



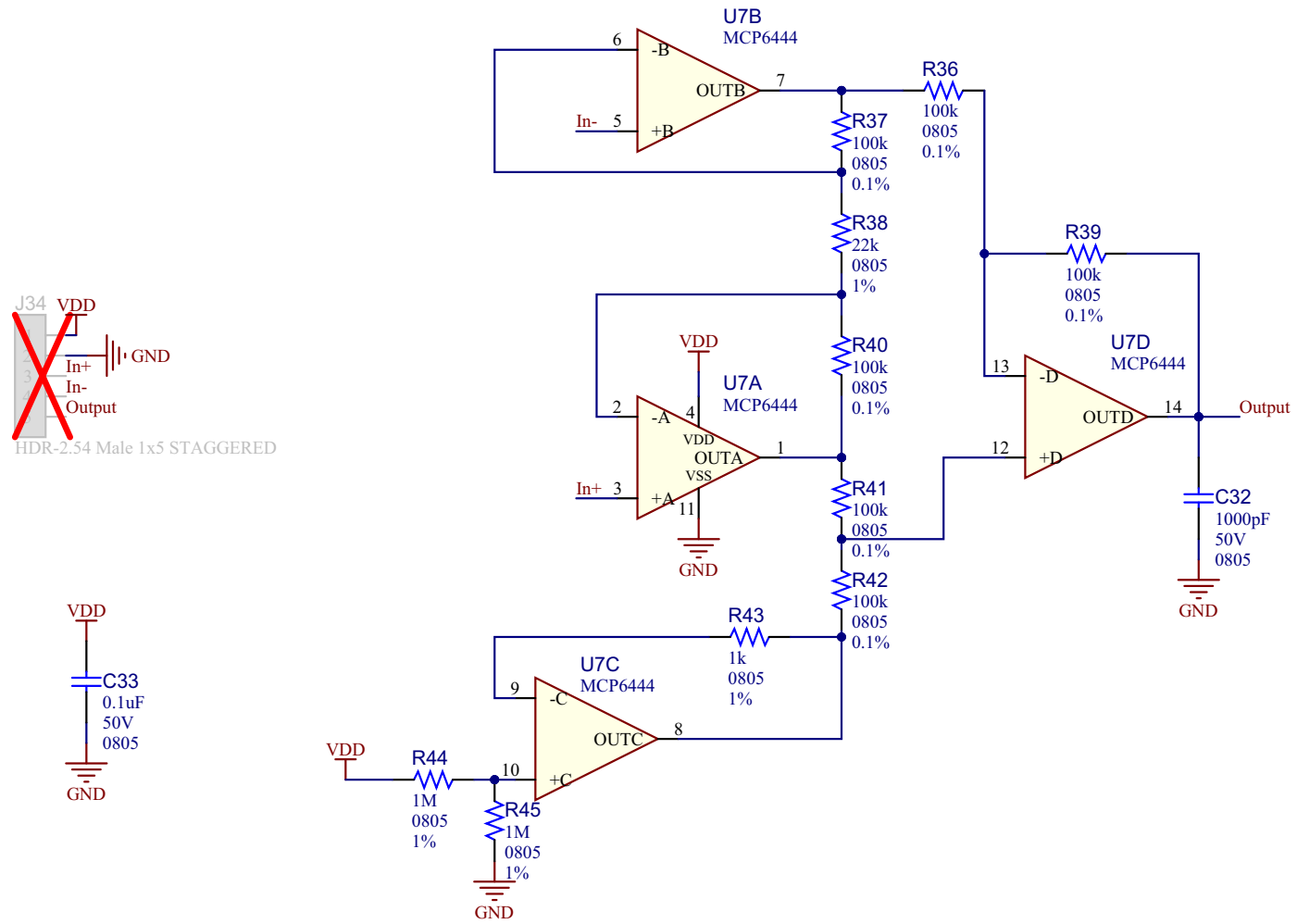
A.3 BOARD – SCHEMATIC 2



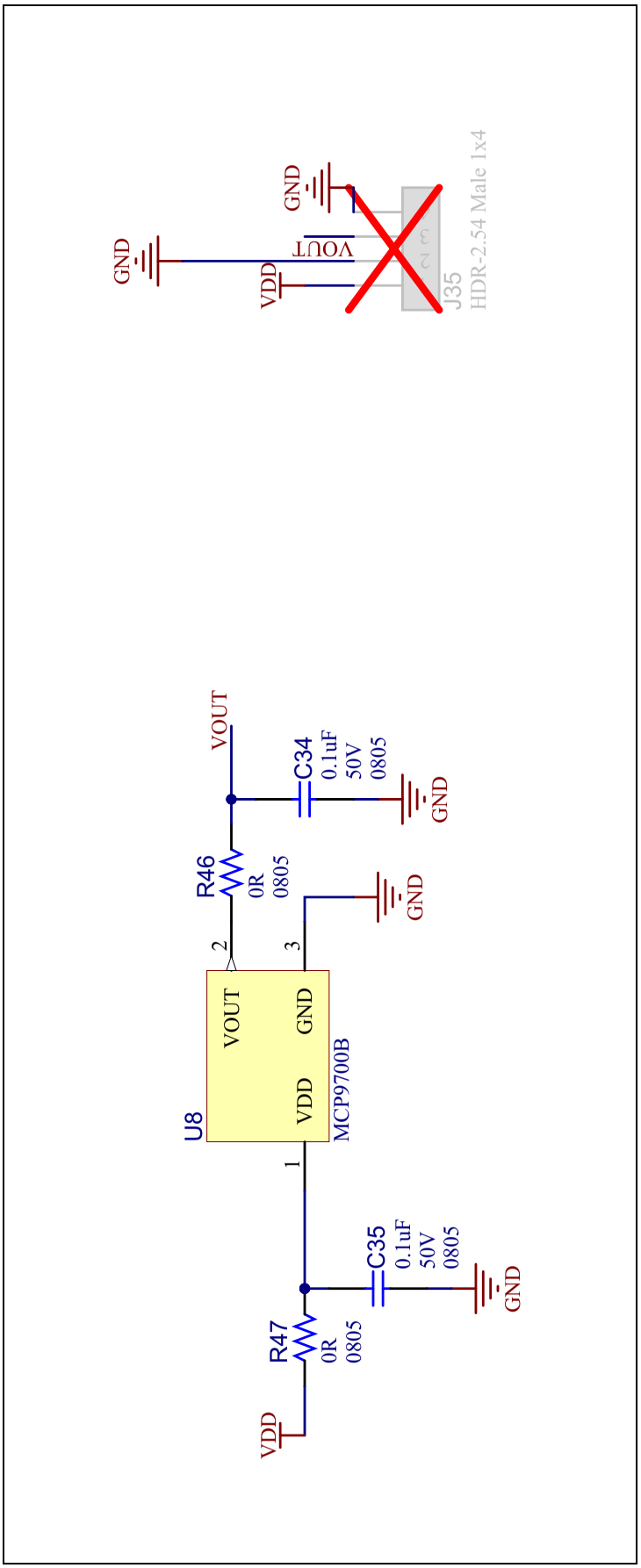
A.4 BOARD – SCHEMATIC 3



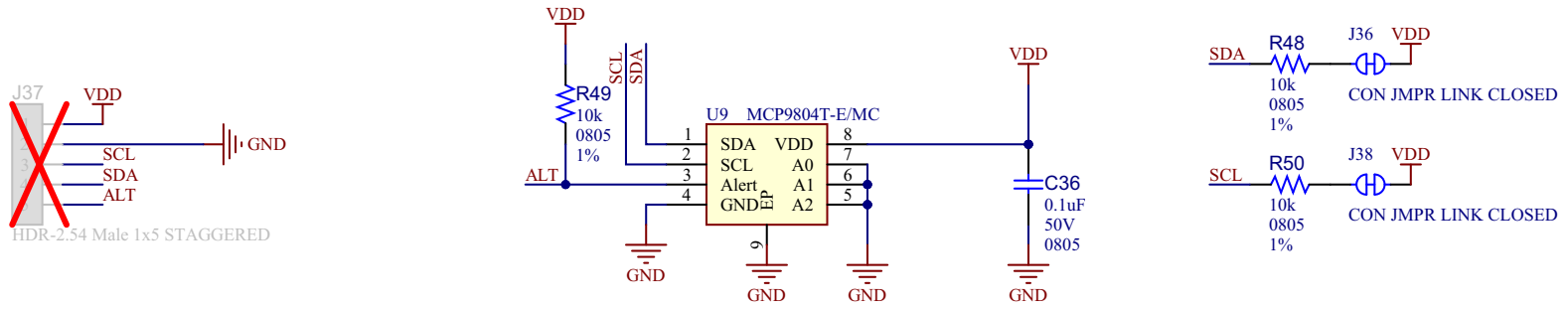
A.5 BOARD – SCHEMATIC 4



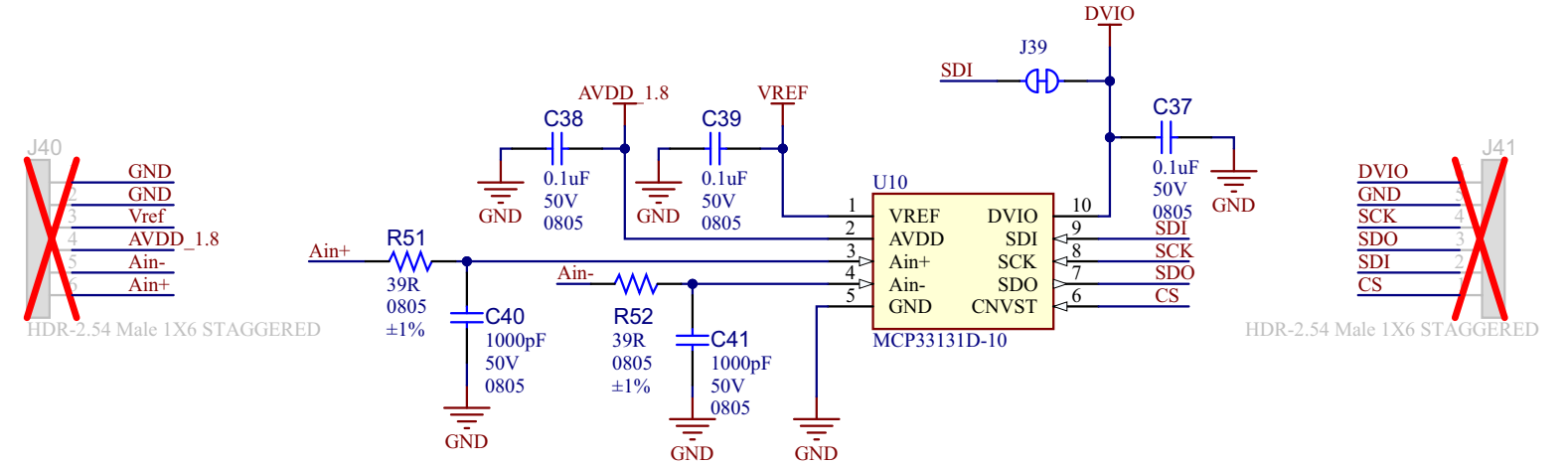
A.6 BOARD – SCHEMATIC 5



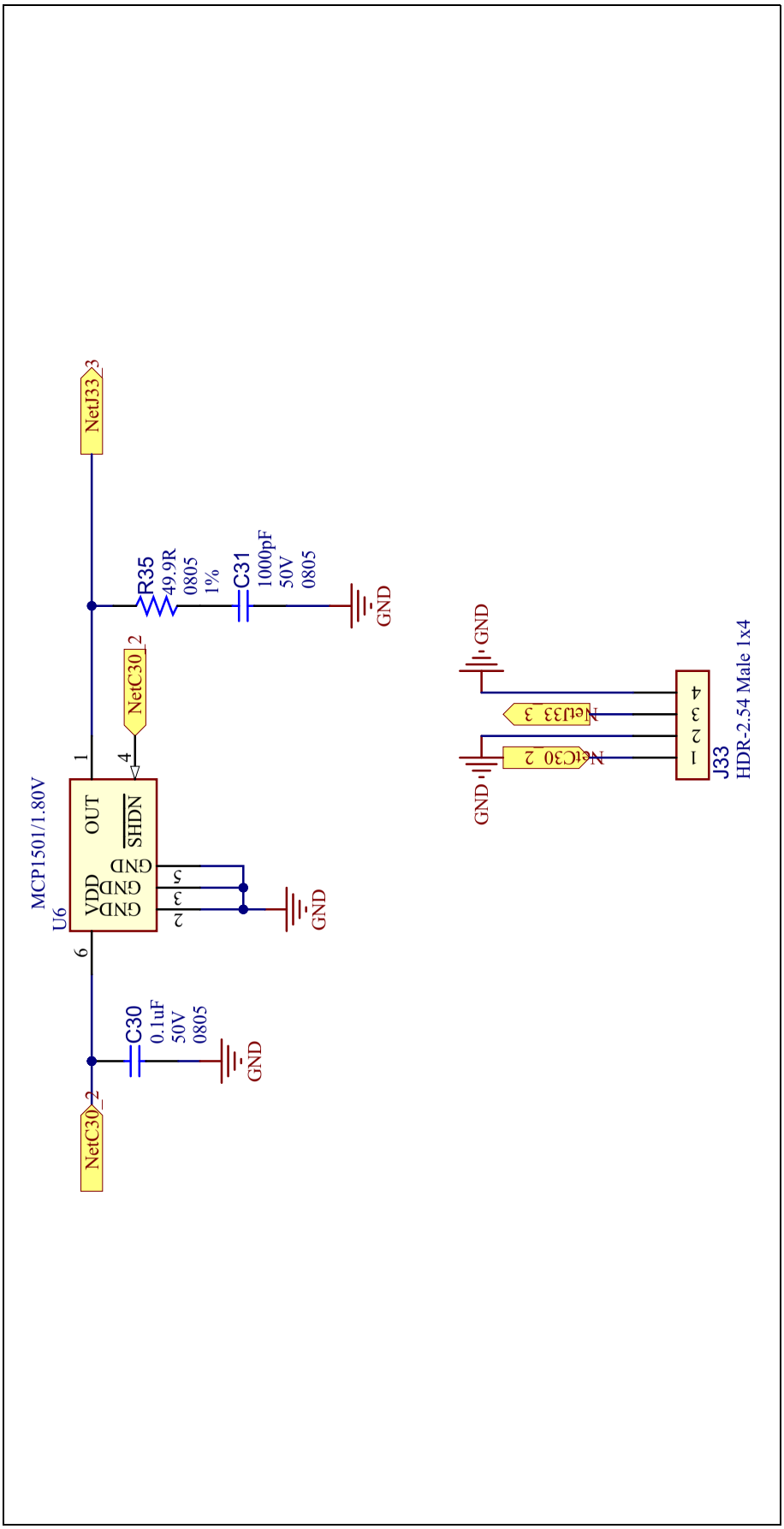
A.7 BOARD – SCHEMATIC 6



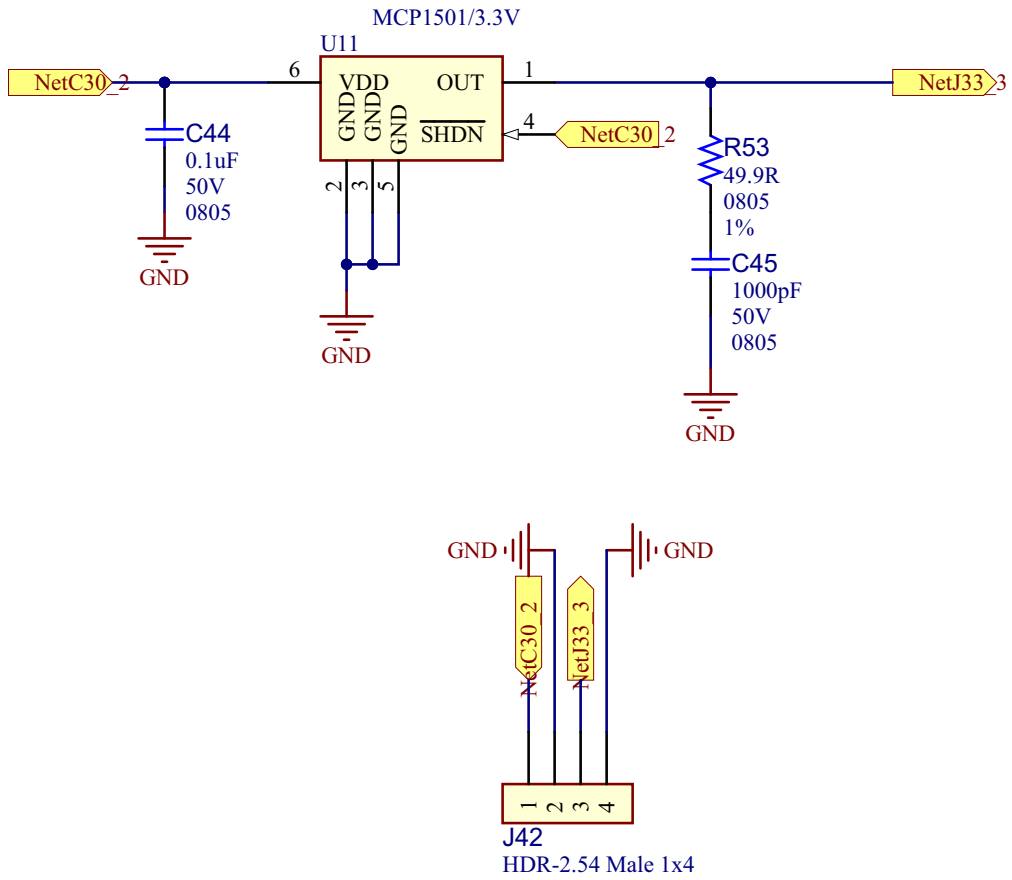
A.8 BOARD – SCHEMATIC 7



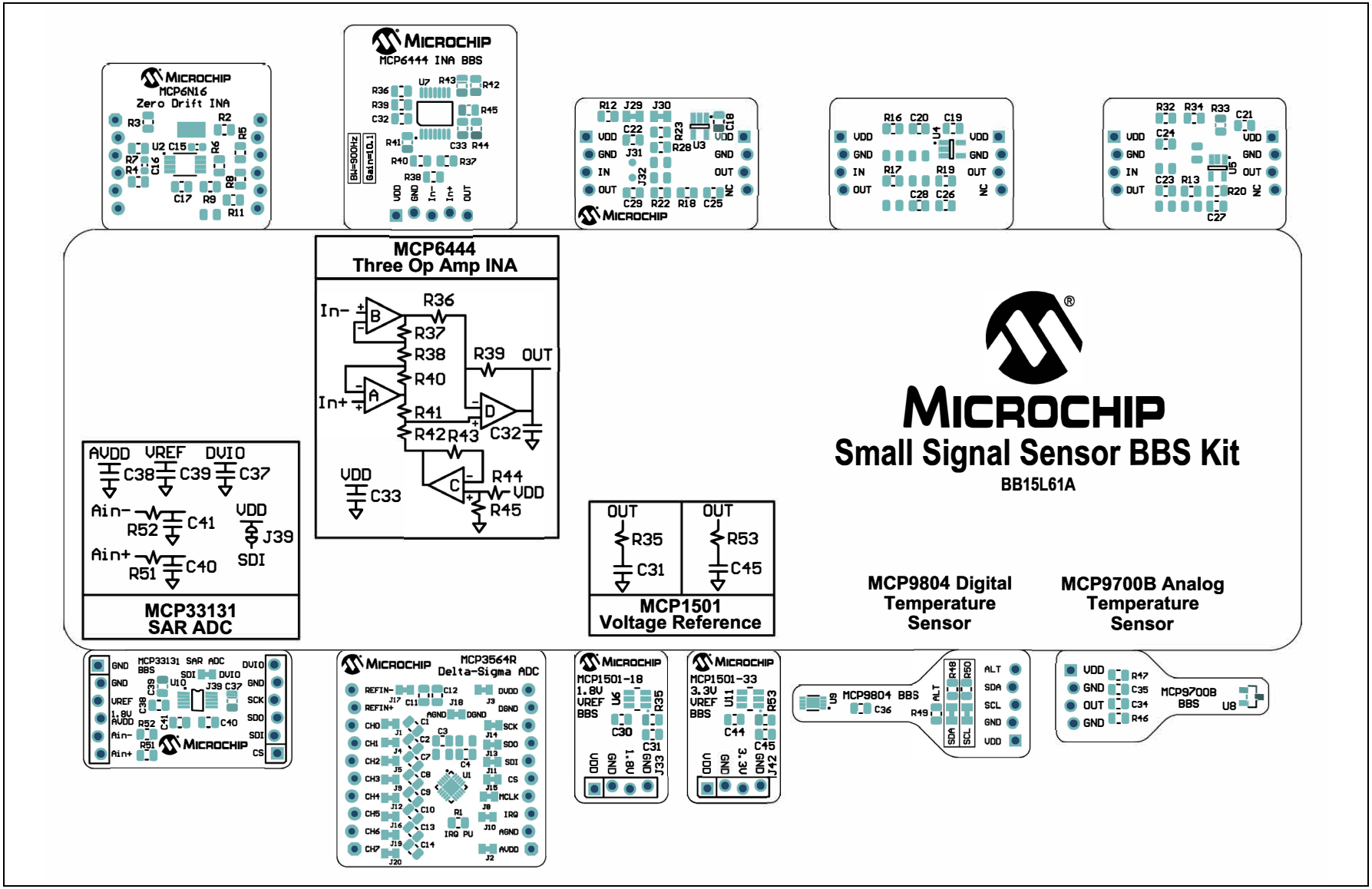
A.9 BOARD – SCHEMATIC 8



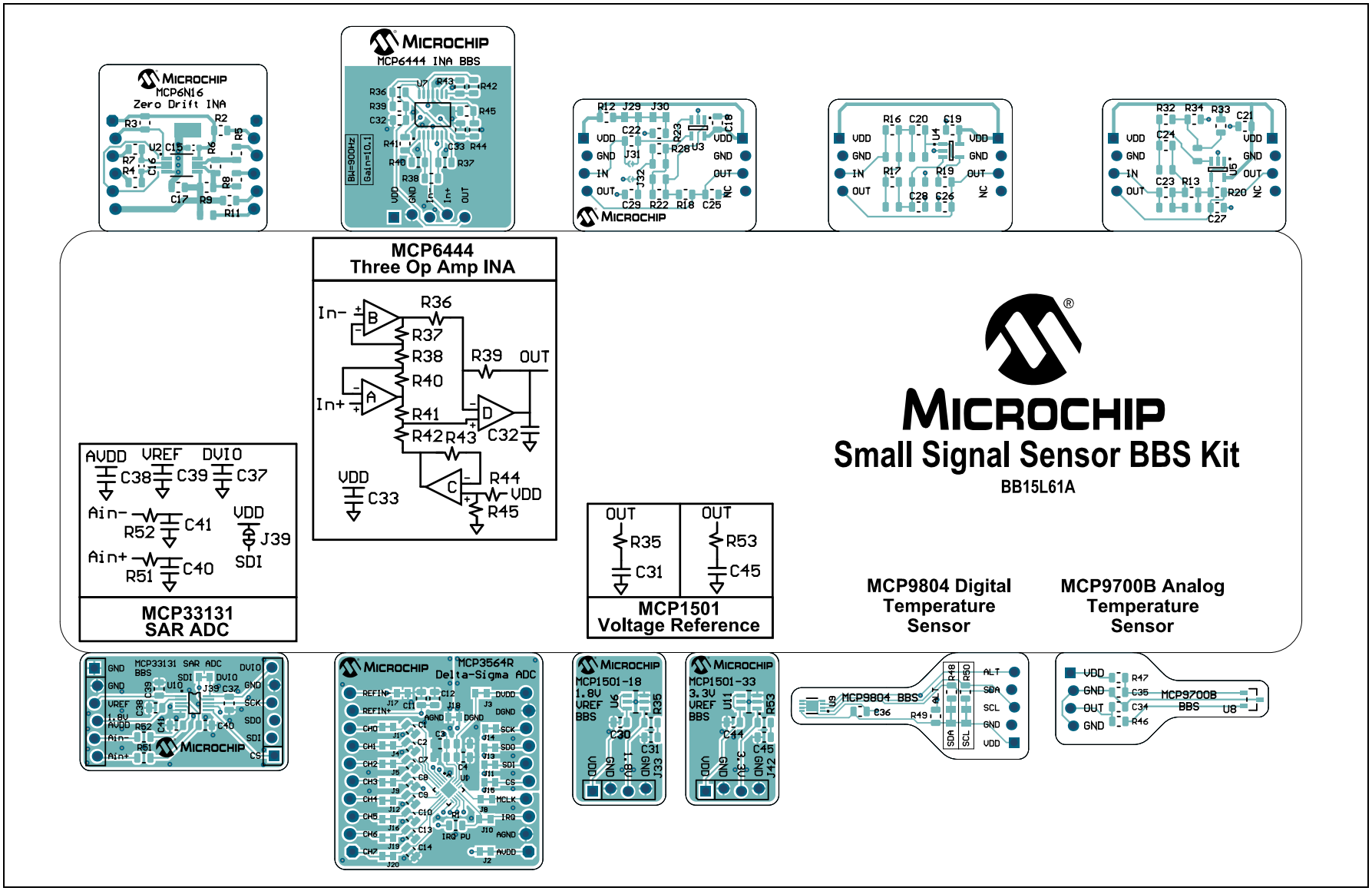
A.10 BOARD – SCHEMATIC 9



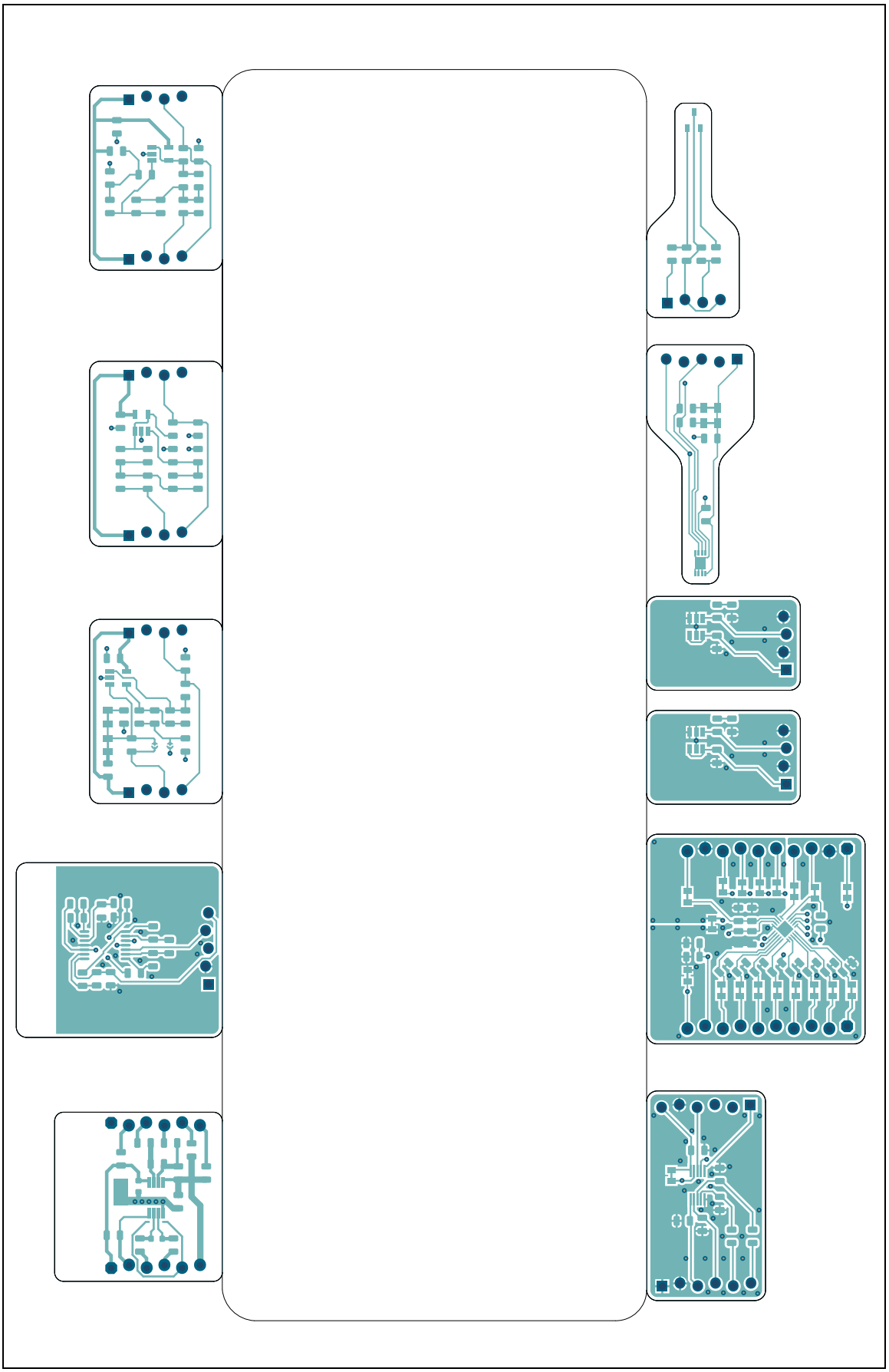
A.11 BOARD – TOP SILK



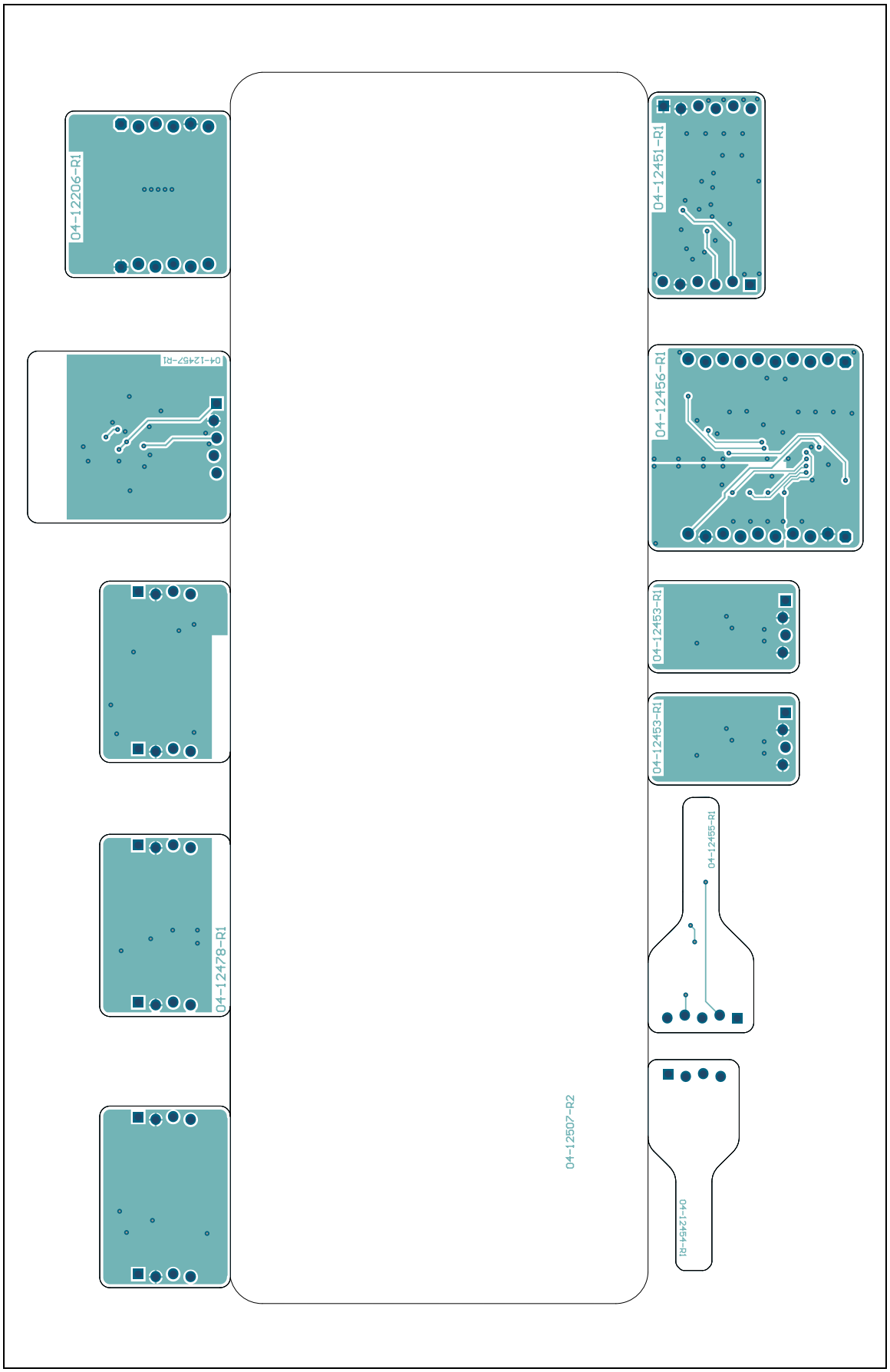
A.12 BOARD – TOP COPPER AND SILK



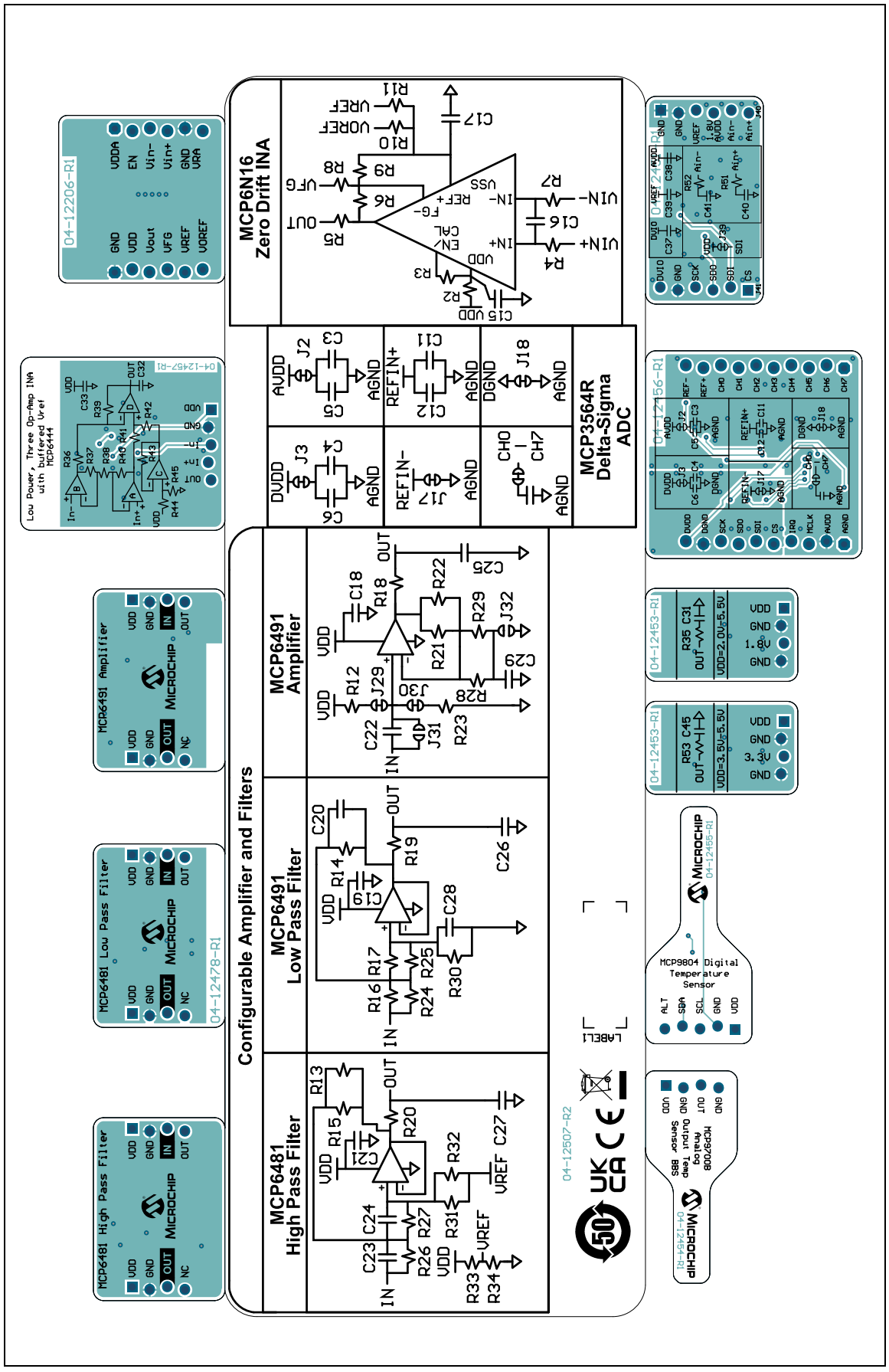
A.13 BOARD – TOP COPPER



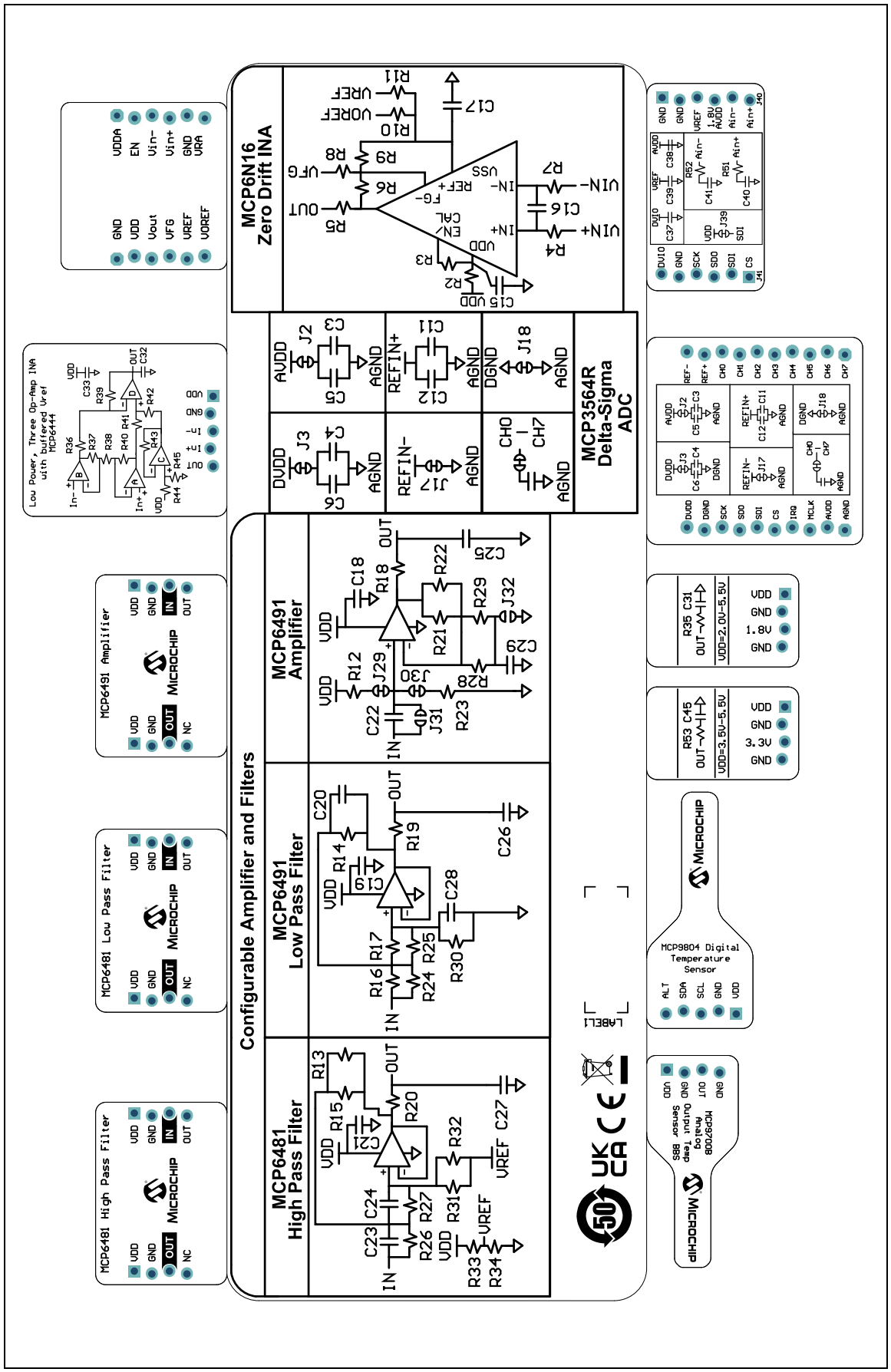
A.14 BOARD – BOTTOM COPPER



A.15 BOARD – BOTTOM COPPER AND SILK



A.16 BOARD – BOTTOM SILK



NOTES:

Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
22	C1, C2, C3, C4, C7, C8, C9, C10, C11, C13, C14, C18, C19, C21, C30, C33, C34, C35, C36, C37, C38, C39	CAP CER 0.1 µF 50V 10% X7R SMD 0805	KYOCERA AVX®	KGM21NR71H104KT
0	C5, C6	CAP CER 0.1 µF 50V 10% X7R SMD 0805 AEC-Q200 (**Do Not Populate**)	KEMET	C0805J104K5RACAUTO
1	C15	CAP CER 0.1 µF 50V X7R 0603	Yageo	CC0603KRX7R9BB104
1	C16	CAP CER 1000 pF 50V 10% X7R SMD 0603	TDK Corporation	C1608X8R1H102K080AA
2	C12, C17	CAP CER 10 µF 10V 10% X5R SMD 0805	Taiyo Yuden Co., Ltd.	LMK212BJ106KD-T
4	C31, C32, C40, C41	CAP CER 1000 pF 50V 10% X7R SMD 0805	YAGEO Corporation	CC0805KRX7R9BB102
1	C20	CAP CER 680 pF 100V 10% X7R SMD 0805	KYOCERA AVX	08051C681KAT2A
2	C22, C29	CAP CER 1 µF 25V 10% X7R SMD 0805	D5_AVX	08053C105K4Z2A
2	C23, C24	CAP CER 0.47 µF 25V 20% Y5V SMD 0805	Murata Electronics®	GRM21BF51E474ZA01L
3	C25, C26, C27	CAP CER 1800 pF 50V 10% X7R SMD 0805	AVX Corporation	08055C182KAT2A
1	C28	CAP CER 470 pF 50V 5% C0G SMD 0805	KYOCERA AVX	08055A471JAT2A
0	J6, J7	CON HDR-2.54 Male 1x10 Gold 5.84MH TH VERT (**Do Not Populate**)	Aceconn Technology (Shenzhen) Co. Ltd.	GPHA101-1002A001B1BA
0	J21, J22	CON HDR-2.54 Male 1x6 Tin 5.84MH TH VERT (**Do Not Populate**)	Sullins Connector Solutions	PEC06SAAN
0	J23, J24, J25, J26, J27, J28, J33, J35	CON HDR-2.54 Male 1x4 Gold 5.84MH TH VERT (**Do Not Populate**)	Samtec, Inc.	TSW-104-07-G-S
0	J34, J37	CON HDR-2.54 Male 1x5 Staggered DNP (**Do Not Populate**)	Sullins Connector Solutions	PBC05SAAN

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-1: BILL OF MATERIALS (BOM) (CONTINUED)

Qty.	Reference	Description	Manufacturer	Part Number
0	J40, J41	CON HDR-2.54 Male 1x6 Staggered DNP (**Do Not Populate**)	Sullins Connector Solutions	PBC06SAAN
1	LABEL1	LABEL PCBA 18x6 mm Datamatrix Assy# / Rev / Serial / Date	ACT Logimark AS	505462
1	PCB1	Printed Circuit Board	Microchip Technology Inc.	**BB15L61A-R2**
1	PCBA1	PCB Assembly	Microchip Technology Inc.	**04-12507-R2**
7	R1, R28, R33, R34, R48, R49, R50	RES TKF 10k 1% 1/16W SMD 0805	Stackpole Electronics, Inc.	RMCF0805FT10K0
1	R2	RES TKF 10R 1% 1/8W SMD 0805	Vishay Intertechnology, Inc.	CRCW080510R0FKEAC
1	R3	RES TKF 100k 1% 1/8W SMD 0805	ROHM Semiconductor	MCR10EZPF1003
2	R4, R7	RES TKF 2k 1% 1/8W SMD 0805 AEC-Q200	Panasonic® – ECG	ERJ-6ENF2001V
1	R5	RES TKF 20k 1% 1/8W SMD 0805	YAGEO Corporation	RC0805FR-0720KL
9	R6, R12, R23, R36, R37, R39, R40, R41, R42	RES TF 100k 0.1% 1/8W SMD 0805	Panasonic – ECG	ERA-6AEB104V
6	R8, R18, R19, R20, R46, R47	RES TKF 0R 1/8W SMD 0805	Panasonic – ECG	ERJ-6GEY0R00V
1	R9	RES TF 1k 0.1% 1/4W SMD 0805	Susumu Co., Ltd.	RGH2012-2E-P-102-B
0	R10	RES TKF 20k 1% 1/8W SMD 0805 (**Do Not Populate**)	YAGEO Corporation	RC0805FR-0720KL
1	R11	RES TKF 100R 1% 1/8W SMD 0805	Panasonic – ECG	ERJ-6ENF1000V
1	R13	RES TF 8.06K 0.1% 1/10W SMD 0805	TE Connectivity	RN73C2A8K06BTDF
0	R14, R15, R21, R24, R25, R26, R27, R29, R30, R31	RES TKF 9.1k 1% 1/8W SMD 0805 (**Do Not Populate**)	Panasonic – ECG	ERJ-6ENF9101V
1	R16	RES TKF 8.2k 1% 1/8W SMD 0805	YAGEO Corporation	RC0805FR-078K2L
1	R17	RES TKF 13k 1% 1/8W SMD 0805	Panasonic – ECG	ERJ-U06F1302V
1	R22	RES SMD 487K OHM 1% 1/8W 0805	Panasonic – ECG	ERJ-U06F4873V
1	R32	RES TKF 15.8k 1% 1/8W SMD 0805	YAGEO Corporation	RC0805FR-0715K8L
1	R35	RES TKF 49.9R 1% 1/8W SMD 0805	Panasonic – ECG	ERJ-6ENF49R9V
1	R38	RES TKF 22k 1% 1/8W SMD 0805 AEC-Q200	Stackpole Electronics, Inc.	RMCF0805FT22K0

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-1: BILL OF MATERIALS (BOM) (CONTINUED)

Qty.	Reference	Description	Manufacturer	Part Number
1	R43	RES TKF 1k 1% 1/8W SMD 0805	Vishay Intertechnology, Inc.	CRCW08051K00FKEA
2	R44, R45	RES TKF 1M 1% 1/8W SMD 0805	Panasonic – ECG	ERJ-6ENF1004V
2	R51, R52	RES TKF 39R 1% 1/8W SMD 0805 AEC-Q200	Stackpole Electronics, Inc.	RMCF0805FT39R0
0	TP1	CON TP TAB Silver Mini 3.8x2.03 SMD (**Do Not Populate**)	Keystone® Electronics Corp.	5019
1	U1	MCHP ANALOG ADC-DELTA-SIGMA 24-bit MCP3564RT-E/NC UQFN-20	Microchip Technology Inc.	**MCP3564RT-E/NC**
1	U2	MCHP ANALOG OPAMP 1-Ch 35MHz 100V/V MCP6N16-100E/MS MSOP-8	Microchip Technology Inc.	**MCP6N16-100E/MS**
1	U3	MCHP ANALOG OPAMP 1-Ch 7.5MHz MCP6491T-E/OT SOT-23-5	Microchip Technology Inc.	**MCP6491T-E/OT**
2	U4, U5	MCHP ANALOG OPAMP 1-Ch 4MHz MCP6481T-E/OT SOT-23-5	Microchip Technology Inc.	**MCP6481T-E/OT**
1	U6	MCHP ANALOG VREF 1.80V MCP1501T-18E/CHY SOT-23-6	Microchip Technology Inc.	**MCP1501T-18E/CHY**
1	U7	MCHP ANALOG OPAMP 4-Ch 9lHz MCP6444-E/ST TSSOP-14	Microchip Technology Inc.	**MCP6444-E/ST**
1	U8	MCHP ANALOG TEMPERATURE SENSOR -40C to +150C MCP9700BT-H/TT SOT-23-3	Microchip Technology Inc.	**MCP9700BT-H/TT**
1	U9	MCHP ANALOG TEMPERATURE SENSOR -40C to +125C MCP9804-E/MC DFN-8	Microchip Technology Inc.	**MCP9804T-E/MC**
1	U10	MCHP ANALOG ADC-SAR 16-bit MCP33131D-10-E/MS MSOP-10	Microchip Technology Inc.	**MCP33131D-10-E/MS**

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.