MCP2210 Breakout Module User's Guide

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MCP2210 BREAKOUT MODULE USER'S GUIDE

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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 web site (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 "DSXXXXXA", where "XXXXX" 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 MCP2210 Breakout Module. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes how to use the MCP2210 Breakout Module board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP2210 Breakout Module
- **Chapter 2. "Installation and Operation"** – Covers the initial set-up of this board, required tools, board setup and Graphical User Interface (GUI)
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and board layouts for the MCP2210 Breakout Module User's Guide
- **Appendix B. "Bill of Materials"** – Lists the parts used to populate the MCP2210 Breakout Module

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 MCP2210 Breakout Module. Other useful documents are listed below. The following Microchip document is available and recommended as a supplemental reference resource.

- **MCP2210 Data Sheet - *"USB-to-SPI Protocol Converter with GPIO (Master Mode)"* (DS22288)**

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
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CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- 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 web site at: http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (March 2012)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the MCP2210 Breakout Module and covers the following topics:

- MCP2210 Breakout Module General Description
- What the MCP2210 Breakout Module Kit Includes

1.2 MCP2210 BREAKOUT MODULE GENERAL DESCRIPTION

The MCP2210 Breakout Module is a development and evaluation platform for the MCP2210 device. The module is comprised of a single DIP form-factor board.

The MCP2210 Breakout Module has the following features:

- SPI bus signals (MOSI, MISO, SCK)
- Nine GP lines, configurable for GPIO, Chip Select or dedicated function operation
- Provides a user selectable (by using a jumper) power supply of 3.3V or 5V (up to 500 mA)
- DIP form-factor (0.6 inches overall row spacing between pins)
- PICkit™ Serial Analyzer header – used for SPI communication only

A Windows®-based PC software was created to help with the evaluation/demonstration of the MCP2210 device as a USB-to-SPI (Master) device. It allows I/O control and custom device configuration. The software is downloadable from the board web page on www.microchip.com.

A DLL package is included to allow development of custom PC applications using the MCP2210. The DLL package is also available for download on the board web page.

1.3 WHAT THE MCP2210 BREAKOUT MODULE KIT INCLUDES

The MCP2210 Breakout Module Kit includes:

- MCP2210 Breakout Module (ADM00419)
- Mini-USB cable
- Important Information Sheet

NOTES:

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MCP2210 Breakout Module is designed to demonstrate the device as a USB-to-SPI (Master) bridge solution.

The package is comprised of a single board and has the following features:

- Small plug-in board with DIP form factor (600 millimeters overall row spacing between pins)
- Mini-USB connector
- Access to SPI bus and all GP signals through USB port
- PICkit™ Serial Analyzer compatible header
- 3.3 or 5V jumper selectable V_{DD}; the breakout board can be used to supply up to 500 mA to the rest of the system. The board already provides a signal trace between the V_{DD} and the 3.3V rail. For systems requiring 5V V_{DD} power supply, V_{DD} header must be mounted on the board. A jumper will close the middle pin and the 5V pin.

2.2 BOARD SETUP

Follow these steps to set up the MCP2210 Breakout Module:

1. Download the support material (PC applications and DLL libraries) that can be found on the board's page, on the Microchip web site.
2. Attach the MCP2210 Breakout Module to a board that has one or more SPI slave devices attached to a bus (SPI).
3. Plug the MCP2210 Breakout Module in to a PC.
4. The computer operating system will automatically install the driver for this board. When the installation is complete, the board is ready for operation.
5. Install the downloaded PC software.
6. Start the SPI Terminal utility.

2.3 BOARD OPERATION

The MCP2210 will be detected by a Windows PC host as an HID device. The accompanying software can be used to exercise the MCP2210 Breakout Module's features and also provides a reference point for users that want to design their own applications based on the MCP2210 device.

2.3.1 MCP2210 Breakout Board Operation

The MCP2210 Breakout Module can be used as a stand-alone USB-to-SPI (Master) bridge module. The breakout board provides all the signals required to assist the user in building their boards with the MCP2210.

The board has the following features:

- SPI bus signals (MOSI, MISO, SCK)
- Nine GP signals that can be configured for:
  - GPIO functionality (digital input or output pins)
  - Chip Select functionality (working with the SPI bus signals)
  - Dedicated function pins
- Jumper selectable power supply: 3.3 or 5V (up to 500 mA)
- PICkit™ Serial Analyzer header using GP4 pin as Chip Select signal

Note: This function is available only on SPI operations, it does not work on I^2C or UART signals.

- DIP form-factor (0.6 inches overall row spacing between pins)

By using the provided software and libraries, the user can create personalized PC applications, using the breakout board as a USB-to-SPI (Master) bridge adapter.

2.3.2 MCP2210 Utility

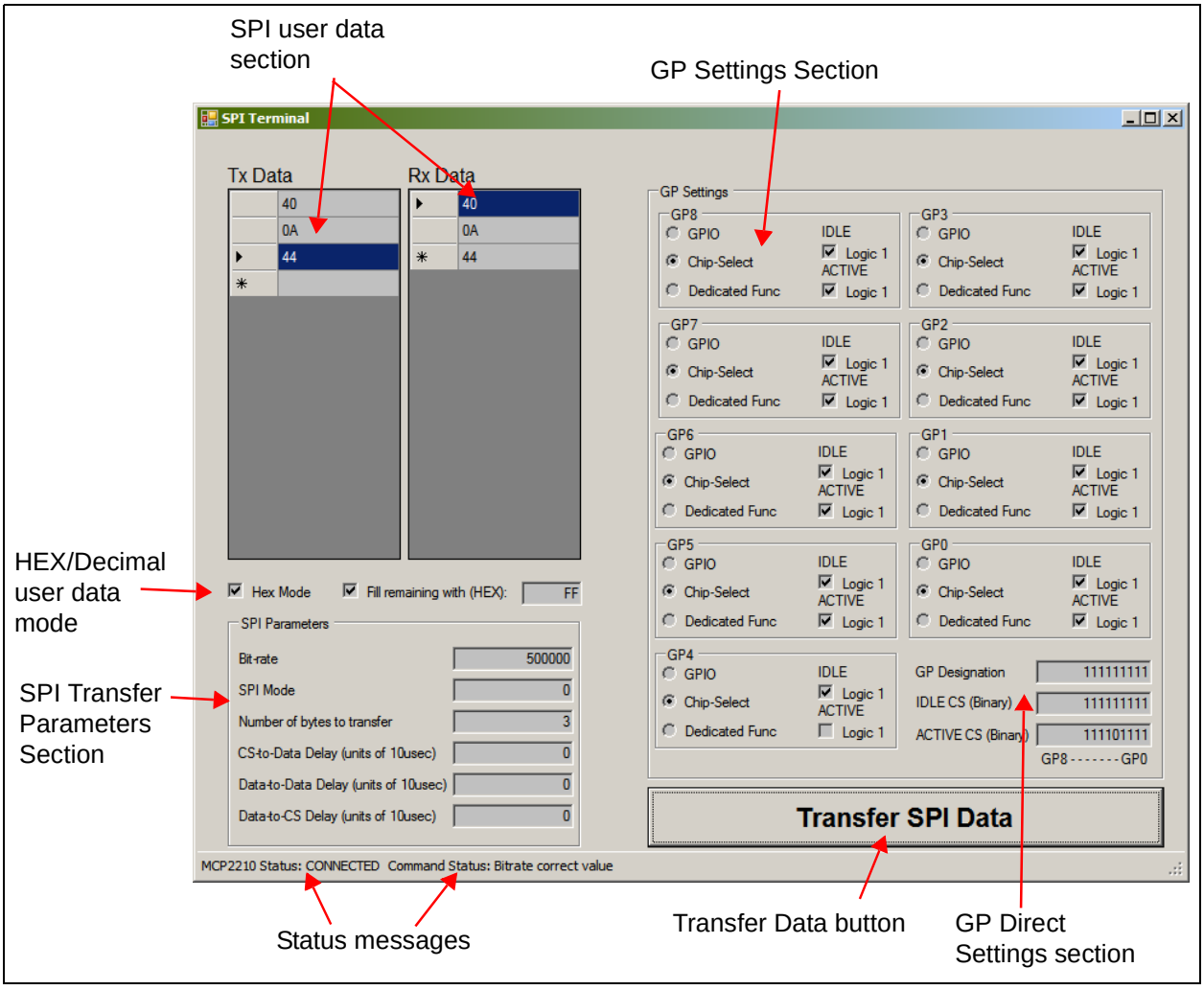
The MCP2210 Utility software was created for custom device setting requirements. A few of the settings that this utility can alter include VID, PID, power requirements, and string descriptors. A download link for this software can be found on the board web page. For instructions on the use of this software, refer to the software's supporting documentation included within the application install package.

2.3.3 SPI Terminal Utility

The SPI Terminal Utility is a tool that allows low-level data exchange at the SPI bus level. This application is useful for low-level communication and troubleshooting between the MCP2210 and various SPI slave modules.

The utility window has different sections for GP designation, SPI transfer parameters and user data areas.

FIGURE 2-1: SPI TERMINAL UTILITY WINDOW



After the application is started, the state of the connection with the MCP2210 is shown in the Status Messages section (lower left corner of the screen).

The user can establish the GP configuration. The GPs can be used as chip select pins. Each GP Active and Idle value can be established by selecting the appropriate check boxes, or by directly supplying the correct value in the GP Direct Settings section. The same behavior applies to the GP designation (the GP designation can be established by clicking the appropriate radio button, or by directly supplying the GP designation value in the GP Settings Direct Values section).

The SPI settings pertaining to the needed SPI transfer can be established in the SPI Parameters section.

The data to be sent goes in the **Tx Data** field. To send the data to the SPI slave device, click the **SPI Transfer Data** button on the lower-right side of the screen. The data received from the SPI slave device is displayed in the **Rx Data** field.

The user data can be supplied in either HEX or Decimal mode. This can be accomplished by selecting the HEX mode check box. The data in the **Tx** and **Rx Data** fields will be displayed in HEX or Decimal.

A wider range of tests is available when using this board and the utility software with the MCP2210 Evaluation Kit (ADM00421). This kit allows communication with several SPI slave devices (I/O expander, EEPROM, ADC and temperature sensor). For more details on examples using the SPI Terminal Utility software, see *MCP2210 Evaluation Kit User's Guide* (DS52057).

2.4 MCP2210 TYPICAL USAGE SCENARIOS

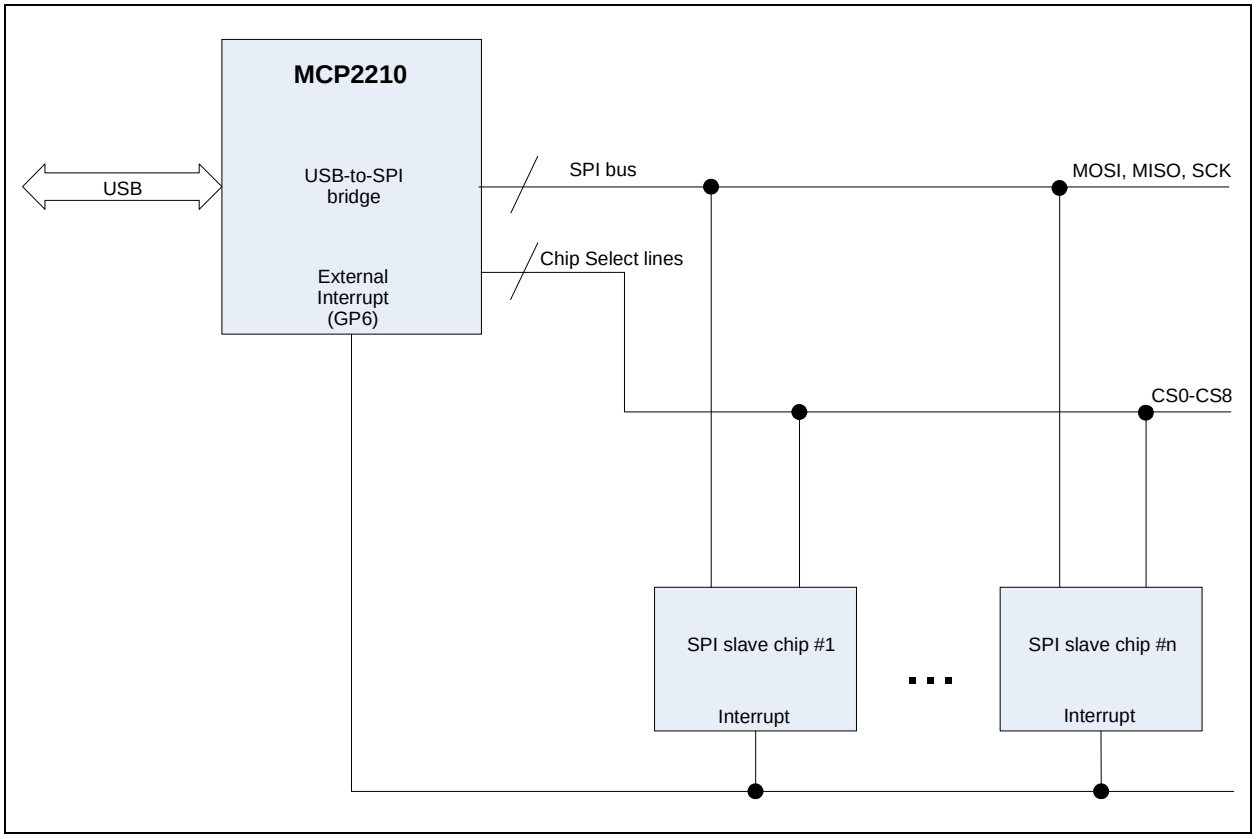
MCP2210 can be used in systems where an SPI bus is available. The MCP2210 can be either the single master on the bus, or one of the masters sharing the bus, if a proper master access arbitration scheme is in place.

A typical usage scenario is shown in Figure 2-2, where MCP2210 is the only master on the SPI bus. This links the SPI slave chips in the system, while a few GPs (configured for Chip Select function) can be used as Chip Select lines.

If SPI slave interrupt monitoring is required, the GP6 needs to be configured for its dedicated function, in order to monitor the interrupts coming from the SPI slave chips.

The PC application will take care of all the details necessary for data transfer between the MCP2210 and the SPI slave chips.

FIGURE 2-2: MCP2210 TYPICAL USAGE DIAGRAM



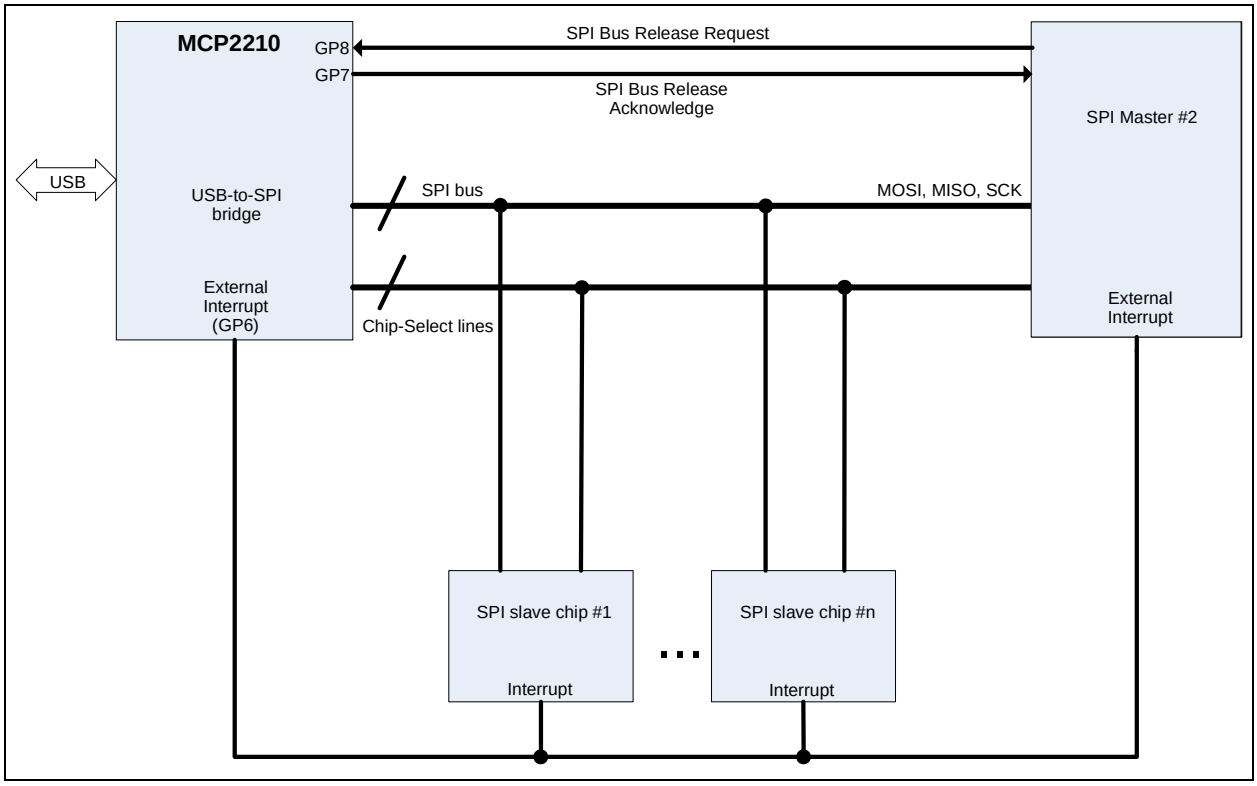
When a system requires more than one SPI master that share the same bus, an arbitration scheme needs to be developed, in order to prevent the multiple SPI masters from accessing the bus at the same time.

MCP2210 has support for an arbitration mechanism which uses GP7 and GP8 (configured for dedicated pin functionality) for this purpose.

When GP8 is configured for its dedicated functionality, the pin can be used as a bus release request for MCP2210 coming from another master. GP7 (configured for its dedicated functionality) is used as an SPI bus release acknowledge signal towards the requesting master. When an external SPI master requests the MCP2210 to release the bus, the device completes the current SPI transfer (or it can be cancelled by the PC application sending the proper USB command), then releases the bus and signals the event on the acknowledge pin (GP7). The second master now has ownership of the bus, and can keep it, as long as the SPI bus request pin (GP8) is kept asserted.

By using the dedicated functionality of the GP7 and GP8, the MCP2210 can be used in a multiple SPI master system.

FIGURE 2-3: MCP2210 TYPICAL USAGE DIAGRAM



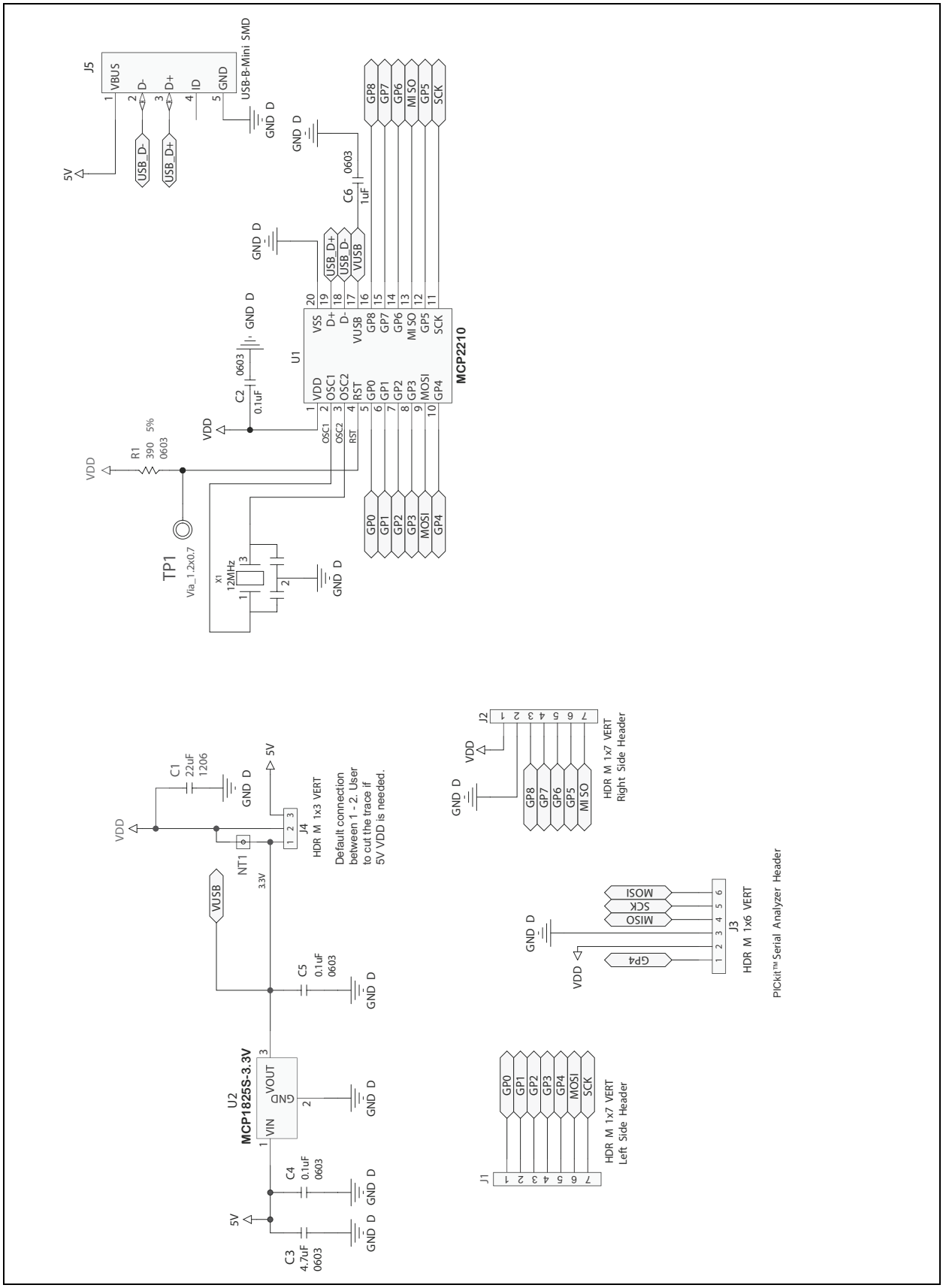
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

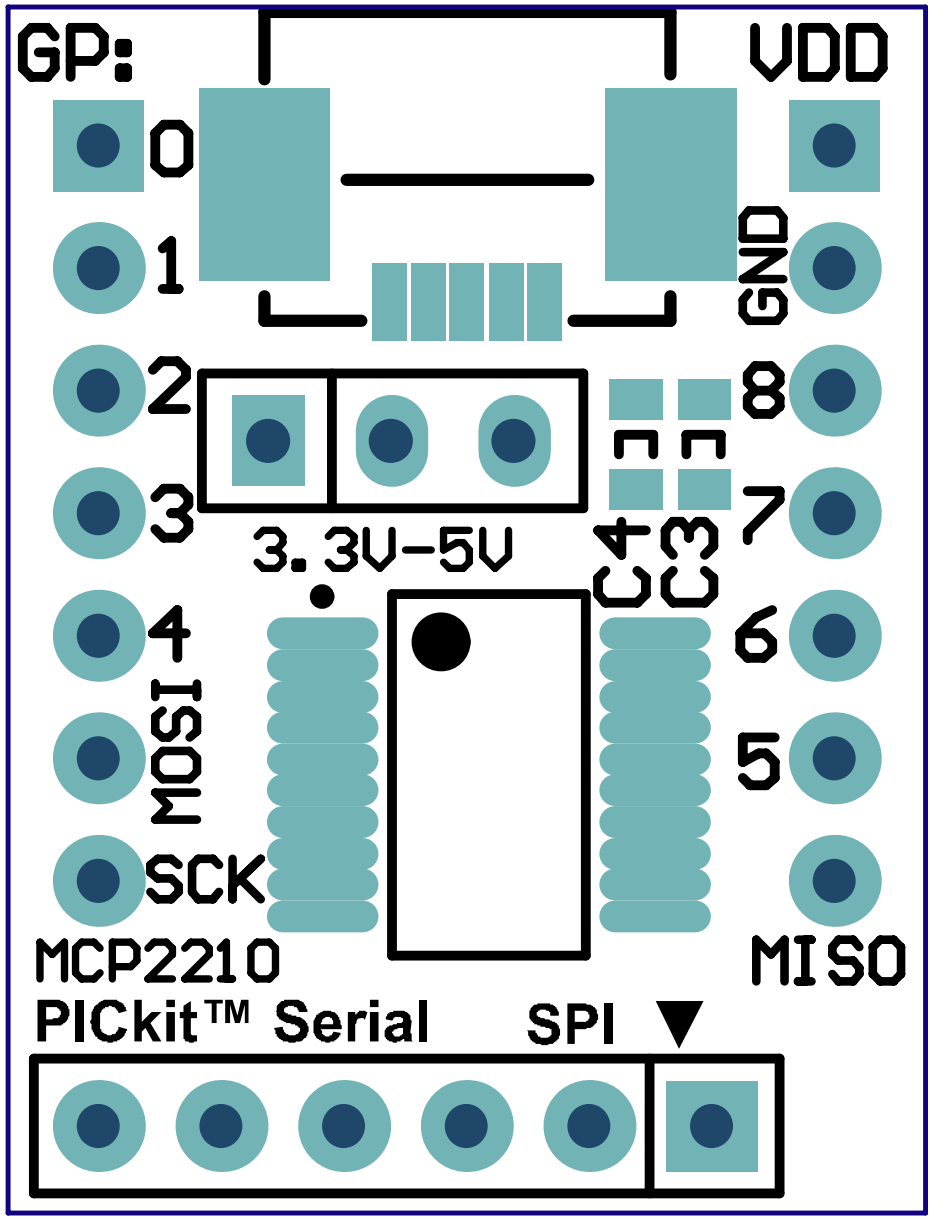
This appendix contains the following schematics and layouts for the MCP2210 Breakout Module:

- Board – Schematic
- Board – Top Silk and Pads
- Board – Top Silk, Pads and Copper
- Board – Top Pads and Copper
- Board – Bottom Silk and Pads
- Board – Bottom Silk, Pads and Copper
- Board – Bottom Pads and Copper

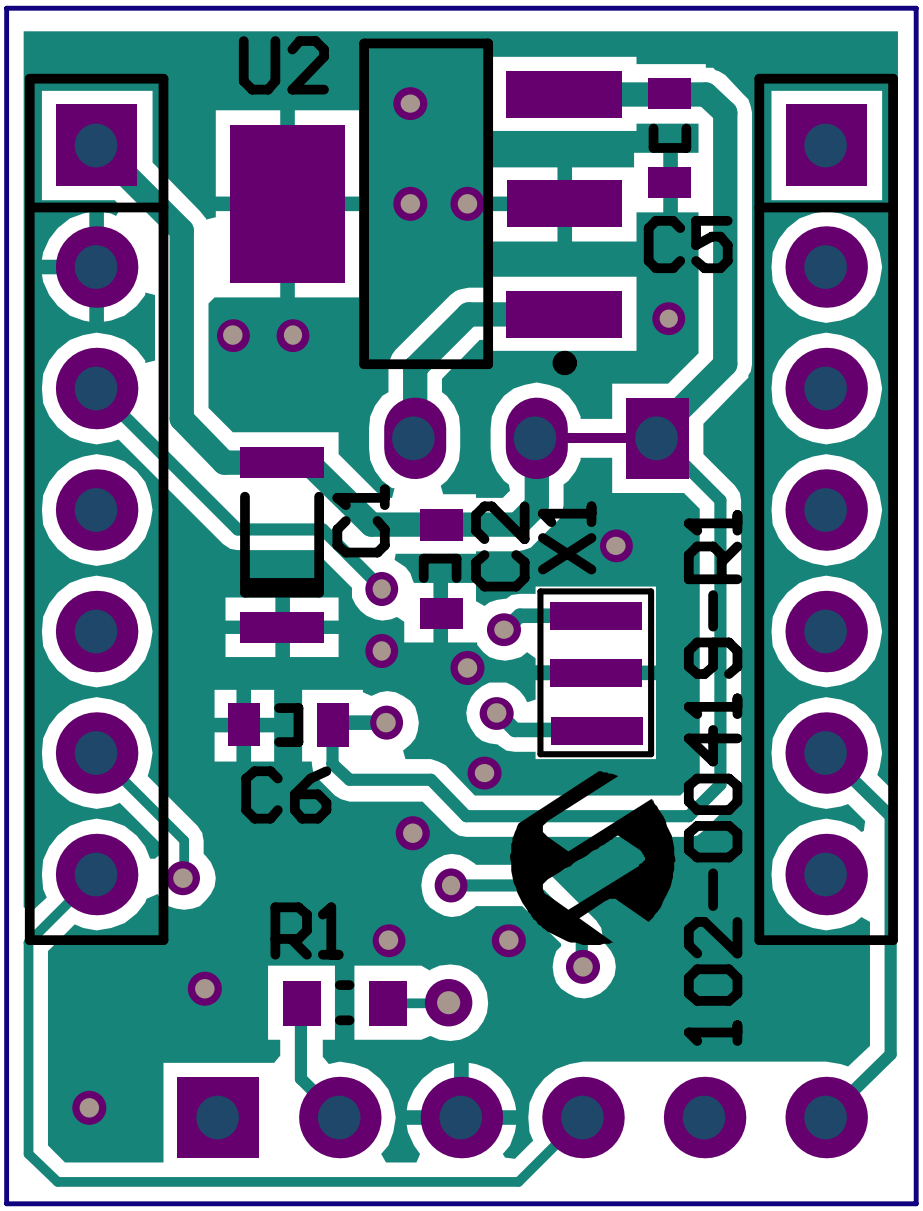
A.2 BOARD – SCHEMATIC



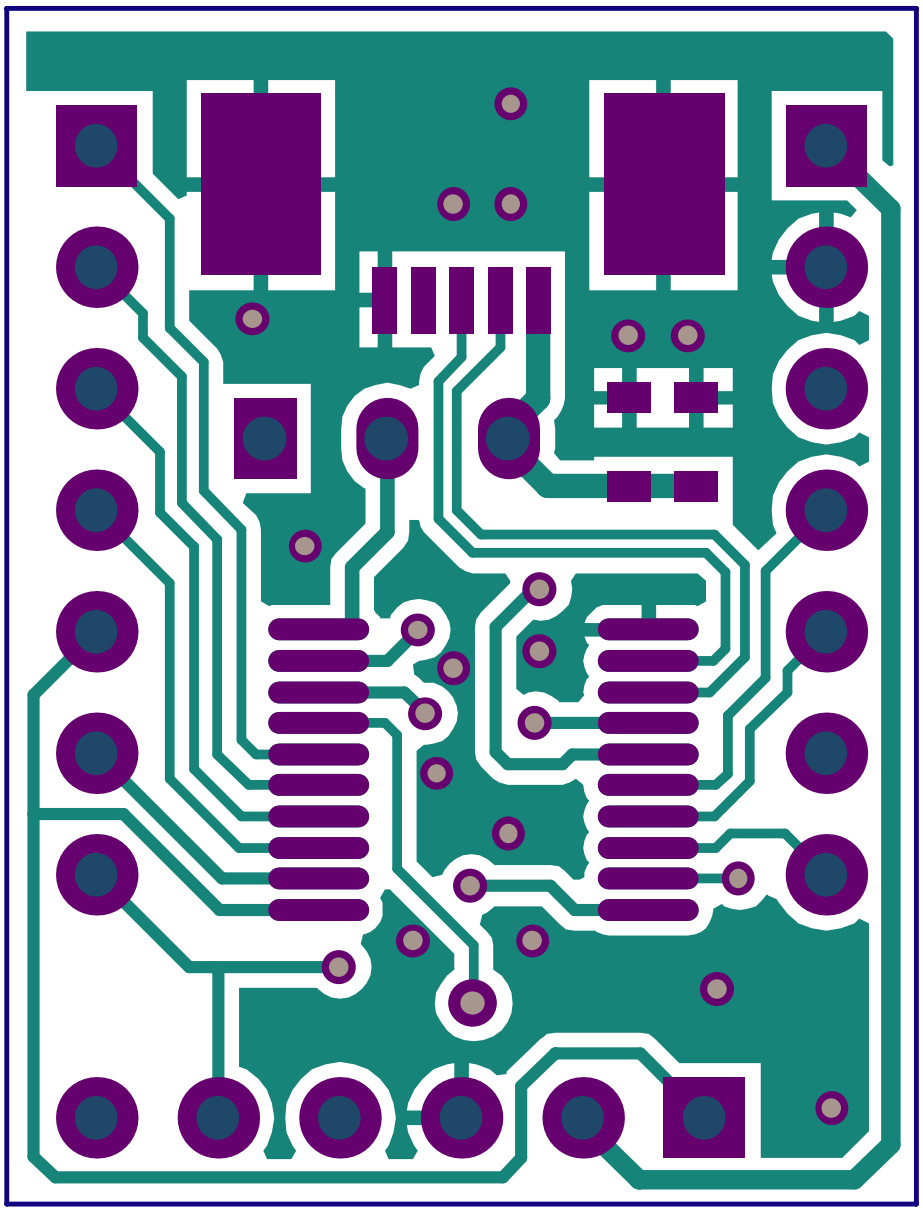
A.3 BOARD – TOP SILK AND PADS



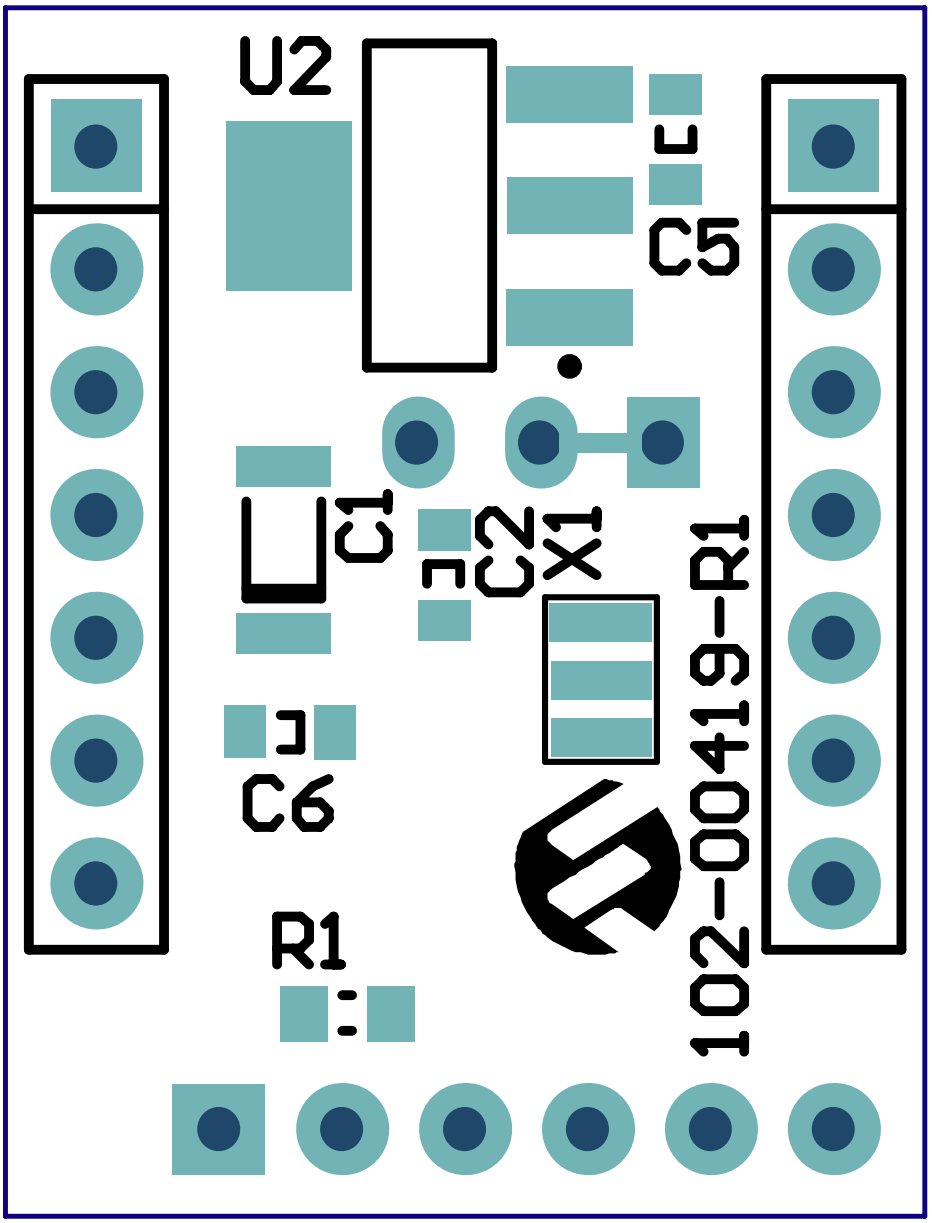
A.4 BOARD – TOP SILK, PADS AND COPPER



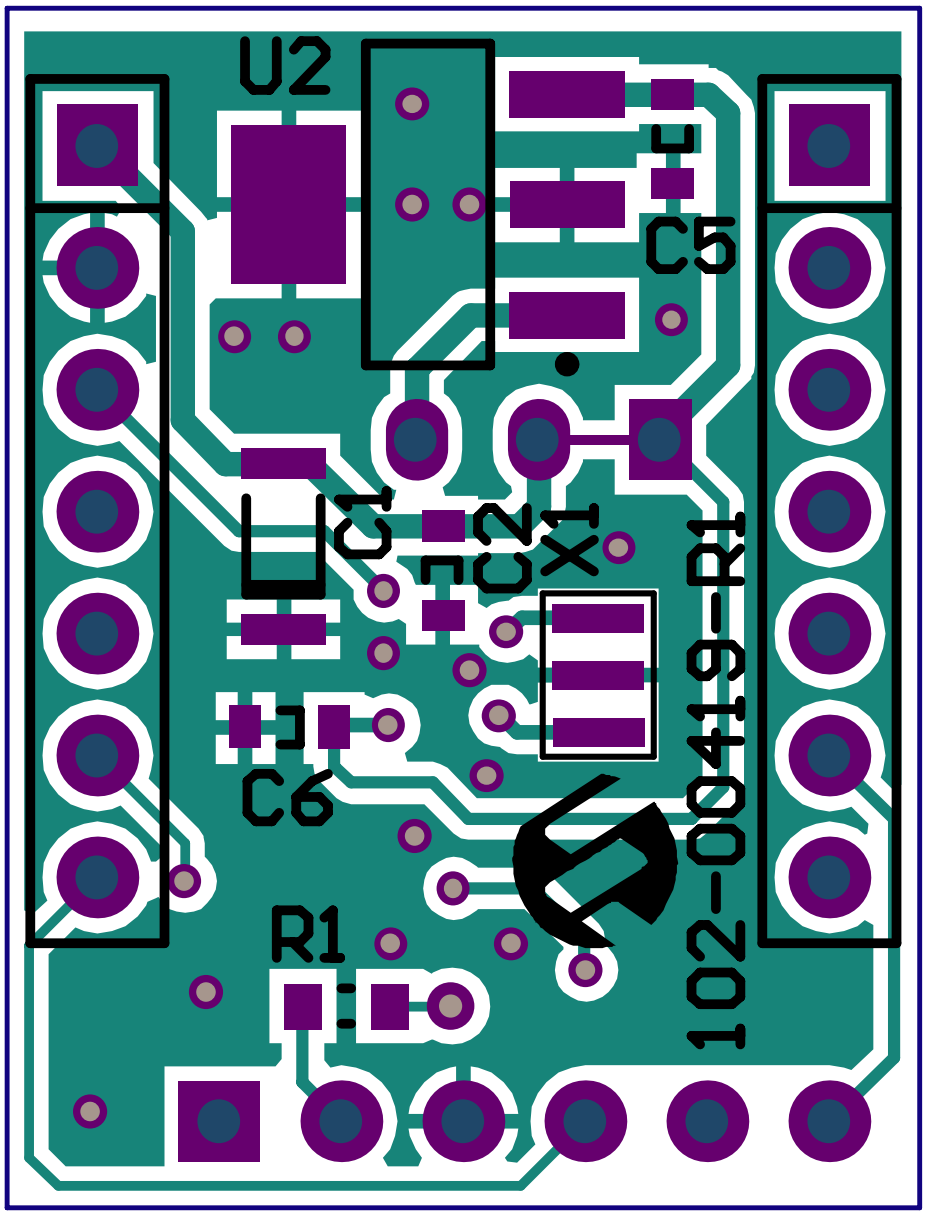
A.5 BOARD – TOP PADS AND COPPER



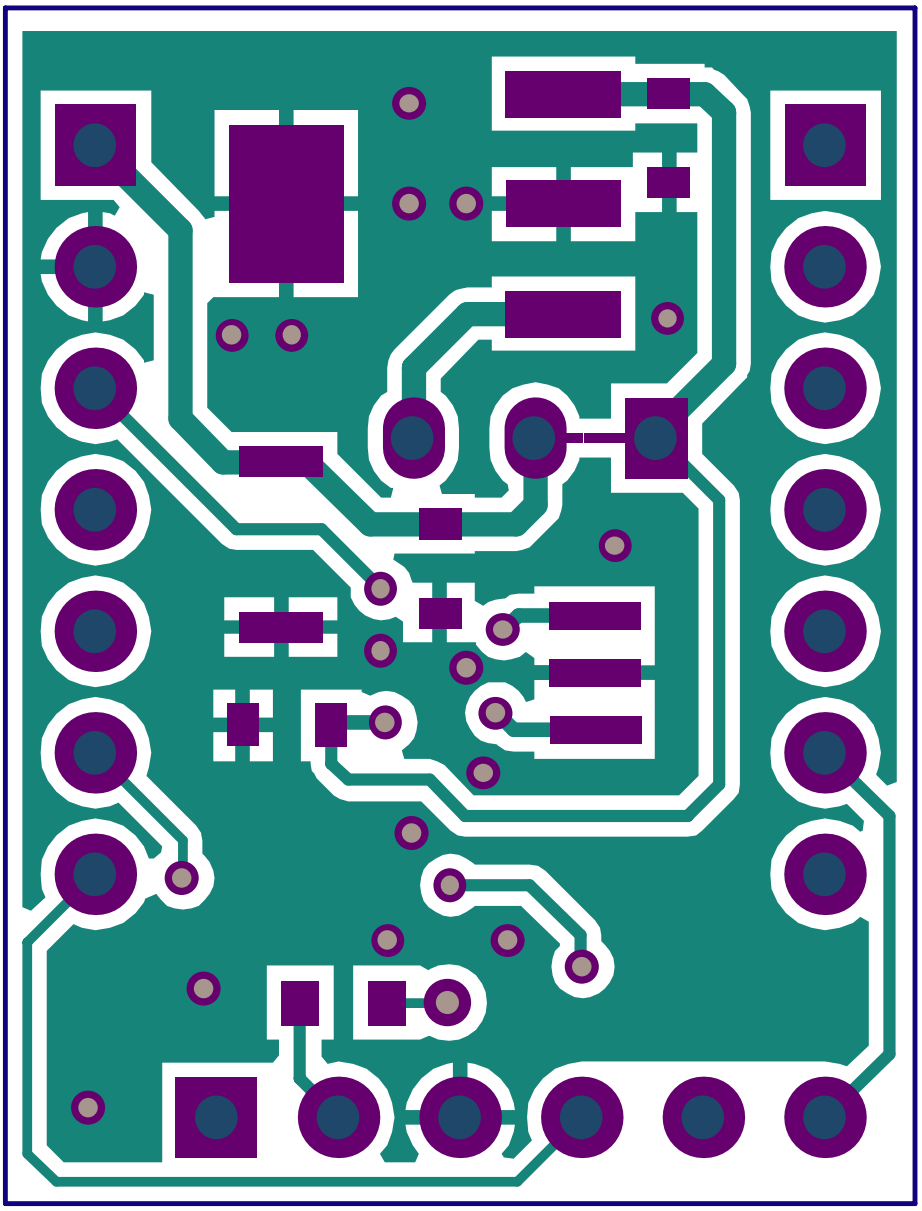
A.6 BOARD – BOTTOM SILK AND PADS



A.7 BOARD – BOTTOM SILK, PADS AND COPPER



A.8 BOARD – BOTTOM PADS AND COPPER



Appendix B. Bill of Materials

TABLE B-1: BILL OF MATERIALS

Qty	Designator	Description_	Manufacturer 1	Part Number
1	C1	Cap. Cerm. 22 uF 10V 20% Y5V 1206	TDK®Corporation	C3216Y5V1A226Z
3	C2, C4, C5	Cap. Cerm .1 uF 10% 16V X7R 0603	AVX Corporation	0603YC104KAT2A
1	C3	Cap. Cerm. 4.7 uF 6.3V 10% X5R 0603	TDK Corporation	C1608X5R0J475K
1	C6	Cap. Cerm. 1 uF 16V 10% X7R 0603	TDK Corporation	C1608X7R1C105K
2	J1, J2	**DO NOT POPULATE** Conn. Hdr. Male .100 1x7 Pos. Vertical	Tyco® Electronics	HDR M 1x7 Vertical
1	J3	**DO NOT POPULATE** Conn. Hdr. Male .100 1x6 Pos. Vertical	Tyco Electronics	HDR M 1x6 Vertical
1	J4	**DO NOT POPULATE** Conn. Hdr. Male .100 1x3 Pos. Vertical	Tyco Electronics	HDR M 1x3 Vertical
1	J5	Conn. Rcpt. USB Mini B R/A SMD	Hirose Electric Co. Ltd.	UX60SC-MB-5ST(80)
1	R1	Res. 390 Ohm 1/10W 5% 0603 SMD	Panasonic® - ECG	ERJ-3GEYJ391V
1	U1	IC USB-TO-SPI SSOP-20	Microchip Technology Inc.	MCP2210-I/SS
1	U2	IC LDO Reg. 500 mA 3.3V SOT-223-3	Microchip Technology Inc.	MCP1825S-3302E/DB
1	X1	Cer. Resonator 12.0 MHz SMD	Murata Electronics®	CSTCE12M0G55-R0

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.

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