UCS1003-2 Evaluation Board User's Guide

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ISBN: 978-1-5224-0363-0

Object of Declaration: UCS1003-2 Evaluation Board

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:

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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 "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 UCS1003-2 Evaluation Board. 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 UCS1003-2 Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the UCS1003-2 Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on installing and getting started with the UCS1003-2 Evaluation Board.
- **Chapter 3. "Hardware Overview"** – Shows hardware details of the UCS1003-2 Evaluation Board.
- **Appendix A. "Schematics and Layouts"** – Shows the schematic and layout diagrams for the UCS1003-2 Evaluation Board.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the UCS1003-2 Evaluation Board.

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 UCS1003-2 Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **UCS1003-1/2/3 Data Sheet – *"USB Port Power Controller with Charger Emulation"* (DS200005346)**
- **AN 24.20 – *"Using the UCS100x as a Single or Dual Mode Charger"* (DS20005246)**
- **AN 25.16 – *"USB Charging Port ESD Protection Tips for UCS100x"* (DS20005230)**
- **AN 26.0 – *"UCS1002 Current Limit Operation and Features"* (DS20005247)**

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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- 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 2016)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The UCS1003-2 device is a Universal Serial Bus (USB) port power switch with charger emulation. All of the functions of the UCS1003-2 device can be tested and observed with the UCS1003-2 Evaluation Board. A block diagram of this evaluation board test setup is shown in Figure 1-1.

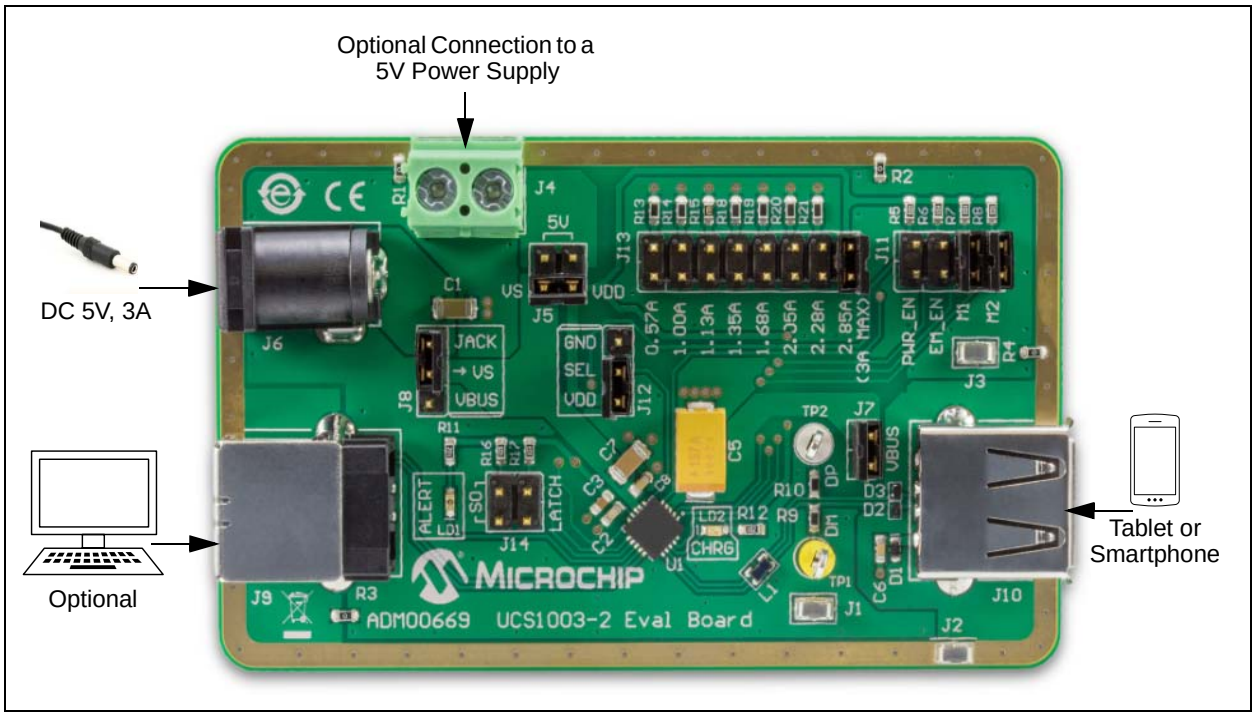


FIGURE 1-1: *UCS1003-2 Evaluation Board – Charger Emulation Test Setup Block Diagram.*

1.2 EVALUATION SYSTEM FEATURES

The evaluation setup is comprised of the UCS1003-2 Evaluation Board and a downstream tablet or cell phone device, which allows the user to:

- Observe the Charger Emulation functionality
- Observe the BC1.2 Charging Downstream Port (CDP), Dedicated Charging Port (DCP) and Standard Downstream Port (SDP) functionality
- Observe the USB Pass-Through functionality

The hardware platform provides the following features to the user:

- Jumpers for Modes of Operation: Dedicated Charger Emulation (DCE), DCP, CDP and USB Pass-Through
- Jumper for Fault Handling: Latch upon Fault or Auto-Recovery
- Jumper for Current-Limiting of 0.57A to 2.85A
- Jumper for PWR_EN

1.3 WHAT THE UCS1003-2 EVALUATION BOARD KIT CONTAINS

This UCS1003-2 Evaluation Board Kit includes:

- UCS1003-2 Evaluation Board (ADM00669)
- Provided 5V Wall Power Adapter
- Important Information Sheet

Chapter 2. Installation and Operation

2.1 GETTING STARTED

2.1.1 System Requirements

To use the UCS1003-2 Evaluation Board, the following are required:

- A 5V supply capable of 5V, 3.0A, or the wall transformer provided in the evaluation kit.
- Various downstream USB devices to charge, such as tablets and cell phones.
- A PC with a USB port to demonstrate CDP, SDP or USB Enumeration.

2.1.2 Evaluation Board Jumper Configuration

Table 2-1 describes each jumper setting used with this evaluation board.

TABLE 2-1: UCS1003-2 EVALUATION BOARD JUMPER DESCRIPTION

Jumper Designator	Jumper Position	Pin Name	Function Description
J5(2)	1-2	V_S	V_S connected to 5V bench power supply
	1-3	V_S, V_{DD}	V_S and V_{DD} tied together
	3-4	V_{DD}	V_{DD} connected to 5V bench power supply
J7(1)	1-2	V_{BUS}	V_{BUS} pins of the UCS1003-2 connected to the V_{BUS} of the USB connector
J8(2)	1-2	V_S	V_S supply connected to the V_{BUS} of the USB host
	2-3	V_S	V_S connected to the 5V input jack
J11	1-2	PWR_EN	Enables or disables the port power switch; Jumper Placed = Logic Low: PWR_EN polarity is set by the SEL pin (see jumper J12)
	3-4	EM_EN	These pins determine Active mode selection (Dedicated Charger Emulation, Data Pass-Through, BC 1.2 SDP, CDP, DCP); Jumper Placed = Logic Low
	5-6	M1	
	7-8	M2	
J12(1)	1-2	SEL	Jumper Placed = Logic Low: PWR_EN is active-low
	2-3		Jumper Placed = Logic High: PWR_EN is active-high
J13(1)	—	ILIM	Current limit selection between 0.57A to 2.85A (typical)
J14	1-2	LATCH	Jumper Placed = Logic Low: LATCH = 0, auto-recovery enabled Jumper Open = Logic High: LATCH = 1, auto-recovery disabled
	3-4	S0	Jumper Placed = Logic Low: S0 = 0, Active mode Jumper Open = Logic High: S0 = 1, Detect mode

Note 1: Each of the J7, J12 and J13 headers must be populated with one jumper for the UCS1003-2 Evaluation Board to be functional.

2: The headers that select the power supply source (J5 and J8) must always have 2 jumpers populated on them in total. For more information, see **Section 3.1.1 "Power Source"**.

Refer to Figure 2-1 for the jumper location.

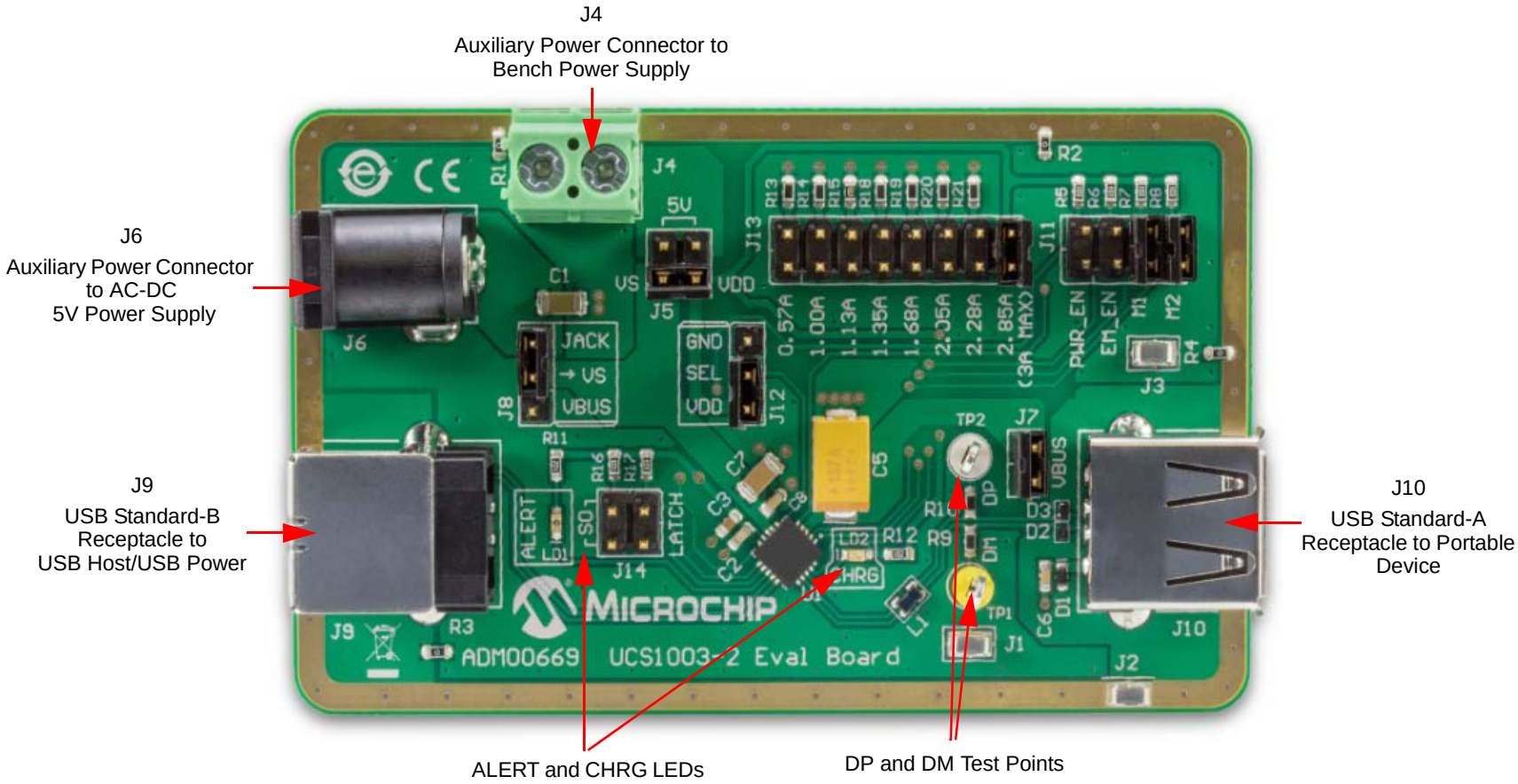


FIGURE 2-1: *UCS1003-2 Evaluation Board Test Setup.*

2.1.3 Configuration for Dedicated Charger Emulation (DCE) Mode

The Dedicated Charger Emulation (DCE) mode configures the UCS1003-2 Evaluation Board to cycle through emulation profiles until the charging current increases above the threshold of 175 mA. To configure the evaluation board for the DCE mode, follow these steps:

1. Configure the jumper settings as shown in Table 2-2.
2. Apply 5V. The UCS1003-2 is set to the Detect state and awaits a downstream device attachment.
3. Connect a tablet or a cell phone to the USB port J10.

When a charger emulation profile is applied and the charging current increases above 175 mA, LD2 (labeled CHRG) will illuminate and charging will continue.

TABLE 2-2: UCS1003-2 EVALUATION BOARD JUMPER DESCRIPTION FOR DCE MODE(1)

Jumper Designator	Jumper Position	Pin Name	Function Description
J7	1-2	V_{BUS}	Jumper Placed = V_{BUS} pins of the UCS connected to the V_{BUS} of the USB connector
J11	1-2	PWR_EN	Jumper Open = Logic High: Port power switch enabled
	3-4	EM_EN	Jumper Open = Logic High
	5-6	M1	Jumper Placed = Logic Low
	7-8	M2	Jumper Placed = Logic Low
J12	2-3	SEL	Jumper Placed = Logic High: PWR_EN is active-high
J13	15-16	ILIM	Jumper Placed on Positions 15-16 and not placed on all the other pins of the header J13: Current limit selection is set to 2.85A typical (3A maximum)
J14	1-2	LATCH	Jumper Placed = Logic Low: LATCH = 0, auto-recovery enabled
	3-4	S0	Jumper Open = Logic High: S0 = 1, Detect mode

Note 1: The power source selection is not mentioned in this table. The headers that select the power supply source (J5 and J8) must always have 2 jumpers populated on them in total. For more information, see **Section 3.1.1 "Power Source"**.

2.1.4 Configuration for BC1.2 Charging Downstream Port (CDP) Mode

The Charging Downstream Port (CDP) mode configures the UCS1003-2 Evaluation Board to handshake respond, enumerate the USB and charge the downstream device. To configure the evaluation board for the CDP mode, follow these steps:

1. Configure the jumper settings as shown in Table 2-3.
2. Connect a cable from USB port J9 (USB-B) to an upstream PC USB port.
3. Apply 5V. The UCS1003-2 is set to the Active state and awaits a downstream device to provide handshake stimulus on the DP pin upon attachment.

TABLE 2-3: UCS1003-2 EVALUATION BOARD JUMPER DESCRIPTION FOR CDP MODE(1)

Jumper Designator	Jumper Position	Pin Name	Function Description
J7	1-2	V_{BUS}	Jumper Placed = V_{BUS} pins of the UCS connected to the V_{BUS} of the USB connector
J11	1-2	PWR_EN	Jumper Open = Logic High: Port power switch enabled
	3-4	EM_EN	Jumper Open = Logic High
	5-6	M1	Jumper Placed = Logic High
	7-8	M2	Jumper Placed = Logic High
J12	2-3	SEL	Jumper Placed = Logic High: PWR_EN is active-high
J13	15-16	ILIM	Jumper Placed on Positions 15-16 and not placed on all the other pins of the header J13: Current limit selection is set to 2.85A typical (3A maximum)
J14	1-2	LATCH	Jumper Placed = Logic Low: LATCH = 0, auto-recovery enabled
	3-4	S0	Jumper Open = Logic High: S0 = 0, Active mode

Note 1: The power source selection is not mentioned in this table. The headers that select the power supply source (J5 and J8) must always have 2 jumpers populated on them in total. For more information, see **Section 3.1.1 "Power Source"**.

2.1.5 Configuration for BC1.2 Dedicated Charging Port (DCP) Mode

The Dedicated Charging Port (DCP) mode configures the UCS1003-2 Evaluation Board to handshake respond and charge the downstream device. The DCP is similar to the Chinese Telecommunications Industry Standard YD/T 1591-2009. To configure the evaluation board for the DCP mode, follow these steps:

1. Configure the jumper settings as shown in Table 2-4.
2. Apply 5V. The UCS1003-2 is set to the Active state and awaits a downstream device to handshake upon attachment.
3. Connect a tablet or a cell phone to the USB port J10.

TABLE 2-4: UCS1003-2 EVALUATION BOARD JUMPER DESCRIPTION FOR DCP MODE(1)

Jumper Designator	Jumper Position	Pin Name	Function Description
J7	1-2	V_{BUS}	Jumper Placed = V_{BUS} pins of the UCS connected to the V_{BUS} of the USB connector
J11	1-2	PWR_EN	Jumper Open = Logic High: Port power switch enabled
	3-4	EM_EN	Jumper Open = Logic High
	5-6	M1	Jumper Placed = Logic Low
	7-8	M2	Jumper Placed = Logic High
J12	2-3	SEL	Jumper Placed = Logic High: PWR_EN is active-high
J13	15-16	ILIM	Jumper Placed on Positions 15-16 and not placed on all the other pins of the header J13: Current limit selection is set to 2.85A typical (3A maximum)
J14	1-2	LATCH	Jumper Placed = Logic Low: LATCH = 0, auto-recovery enabled
	3-4	S0	Jumper Open = Logic High: S0 = 0, Active mode

Note 1: The power source selection is not mentioned in this table. The headers that select the power supply source (J5 and J8) must always have 2 jumpers populated on them in total. For more information, see **Section 3.1.1 "Power Source"**.

2.1.6 Configuration for BC1.2 SDP Mode

The Standard Downstream Port (SDP) mode configures the UCS1003-2 Evaluation Board to close the high-speed switch and allow the USB to enumerate. To configure the evaluation board for the SDP mode, follow these steps:

1. Configure the jumper settings as shown in Table 2-5.
2. Connect a cable from USB port J9 (USB-B) to an upstream PC USB port.
3. Apply 5V. The UCS1003-2 is set to the Active state and awaits a downstream device to enumerate the USB upon attachment.

TABLE 2-5: UCS1003-2 EVALUATION BOARD JUMPER DESCRIPTION FOR SDP MODE(1)

Jumper Designator	Jumper Position	Pin Name	Function Description
J7	1-2	V_{BUS}	Jumper Placed = V_{BUS} pins of the UCS connected to the V_{BUS} of the USB connector
J11	1-2	PWR_EN	Jumper Open = Logic High: Port power switch enabled
	3-4	EM_EN	Jumper Open = Logic Low
	5-6	M1	Jumper Placed = Logic High
	7-8	M2	Jumper Placed = Logic Low
J12	2-3	SEL	Jumper Placed = Logic High: PWR_EN is active-high
J13	15-16	ILIM	Jumper Placed on Positions 15-16 and not placed on all the other pins of the header J13: Current limit selection is set to 2.85A typical (3A maximum)
J14	1-2	LATCH	Jumper Placed = Logic Low: LATCH = 0, auto-recovery enabled
	3-4	S0	Jumper Open = Logic Low: S0 = 0, Active mode

Note 1: The power source selection is not mentioned in this table. The headers that select the power supply source (J5 and J8) must always have 2 jumpers populated on them in total. For more information, see **Section 3.1.1 "Power Source"**.

Chapter 3. Hardware Overview

3.1 INTRODUCTION

The UCS1003-2 Evaluation Board provides the means to demonstrate all of the UCS1003-2 functionality. The LEDs indicate the status information.

3.1.1 Power Source

The UCS1003-2 Evaluation Board requires 5V, 3.0A. It has two power supply connectors:

- J6 jack for AC-DC wall adapters
- J4 for connection with wires from a laboratory power supply

The board allows using only one of these power supplies or both (for the evaluating split supply feature).

According to the note from the Electrical Characteristics table from the data sheet, for split supply systems using the Attach Detection feature, the V_S must not exceed V_{DD} + 150 mV. If this condition cannot be met, then V_{DD} and V_S can be tied together, to avoid a voltage difference higher than 150 mV between them.

The V_S and V_{DD} supply source is selected by populating jumpers on the J5 and J8 headers. The two headers must always have two jumpers populated on them in total. The board is not functional if the jumpers are populated in other configurations. See Table 3-1 for J5 and J8 jumper options.

TABLE 3-1: POWER SUPPLY SELECTION OPTIONS WITH J5 AND J8 HEADERS

Available Power Source(s)			Populated Positions for Jumper J5	Populated Positions for Jumper J8
AC-DC Adapter Connected to Jack J6	USB Port Connected to Jumper J9	Bench Power Supply Connected with Wires to Connector J4		
Yes	No	No	1-3 (V_S tied to V_{DD})(1)	2-3 (V_S tied to jack J6)(1)
No	No	Yes	1-2 (V_S tied to 5V)(2)	N/A
			3-4 (V_{DD} tied to 5V)(2)	
Yes	No	Yes	3-4 (V_{DD} tied to 5V)(3)	2-3 (V_S tied to jack J6)(3)
No	Yes	Yes	3-4 (V_{DD} tied to 5V)(3,4)	1-2 (V_S tied to V_{BUS})(3,4)
No	Yes	No	1-3 (V_S tied to V_{DD})(3,4)	1-2 (V_S tied to V_{BUS})(3,4)

Note 1: Simple setup that can be made with the AC-DC adapter from the UCS1003-2 Evaluation Board Kit.

2: This setup can be used to evaluate the charging process at different supply voltages (up to 5.5 V) and to have an indication of the charging current from the bench power supply.

3: This setup can be used to evaluate the split power supply feature.

4: This setup can be used only if the USB port connected to jumper J9 is capable of delivering the required charging current.

3.2 STAND-ALONE FUNCTIONALITY

The UCS1003-2 is intended for the stand-alone USB charger and BC1.2 CDP, DCP and SDP applications. The green LED (LD2 – CHRG) indicates that the charging current has exceeded the 175 mA threshold (I_{BUS_CHG}).

See Table 2-1 for the description of jumpers.

3.2.1 Charger Emulation Mode Configurations

The Charger Emulation mode of the UCS1003-2 is controlled by the pin states: M1, M2 and EM_EN. These are the jumpers located on the J11 header.

3.2.2 Attach Detection and Power States

The UCS1003-2 can use the attach detection functionality or force the Active mode power state. This is controlled by jumper J14, position 3-4.

3.3 FAULT HANDLING

The UCS1003-2 has two modes of Fault handling that can be configured for the LATCH upon Fault or auto-recovery. Jumper J14, position 1-2, selects the Fault handling. When a Fault condition is detected, the red LED (marked as LD1 – ALERT) turns on.

See Table 2-1 for the description of jumpers.

3.4 CURRENT LIMITING

The UCS1003-2 is capable of eight selectable current limits (see the *"UCS1003-1/2/3 Data Sheet"* for detailed information). Jumper J13 selects the current-limiting value.

See Table 2-1 for the description of jumpers.

3.5 HIGH-SPEED USB DATA SWITCH

The UCS1003-2 contains a series of USB 2.0-compliant high-speed switch between the DP and DM input and output pins. This switch is functional in CDP, SDP and USB pass-through configurations. When used in one of these configurations, a port from a PC must be connected to the J9 USB connector.

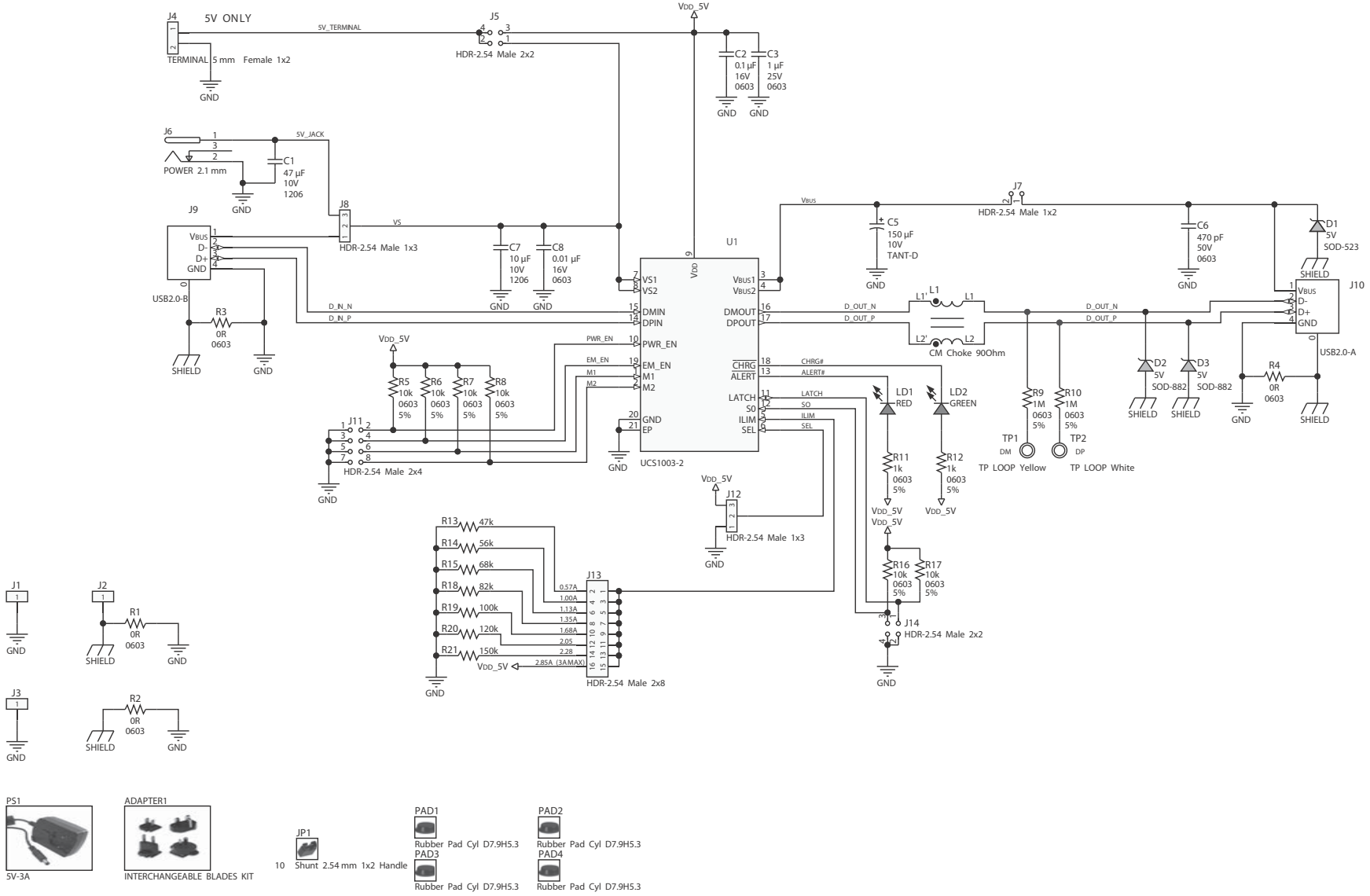
Appendix A. Schematics and Layouts

A.1 INTRODUCTION

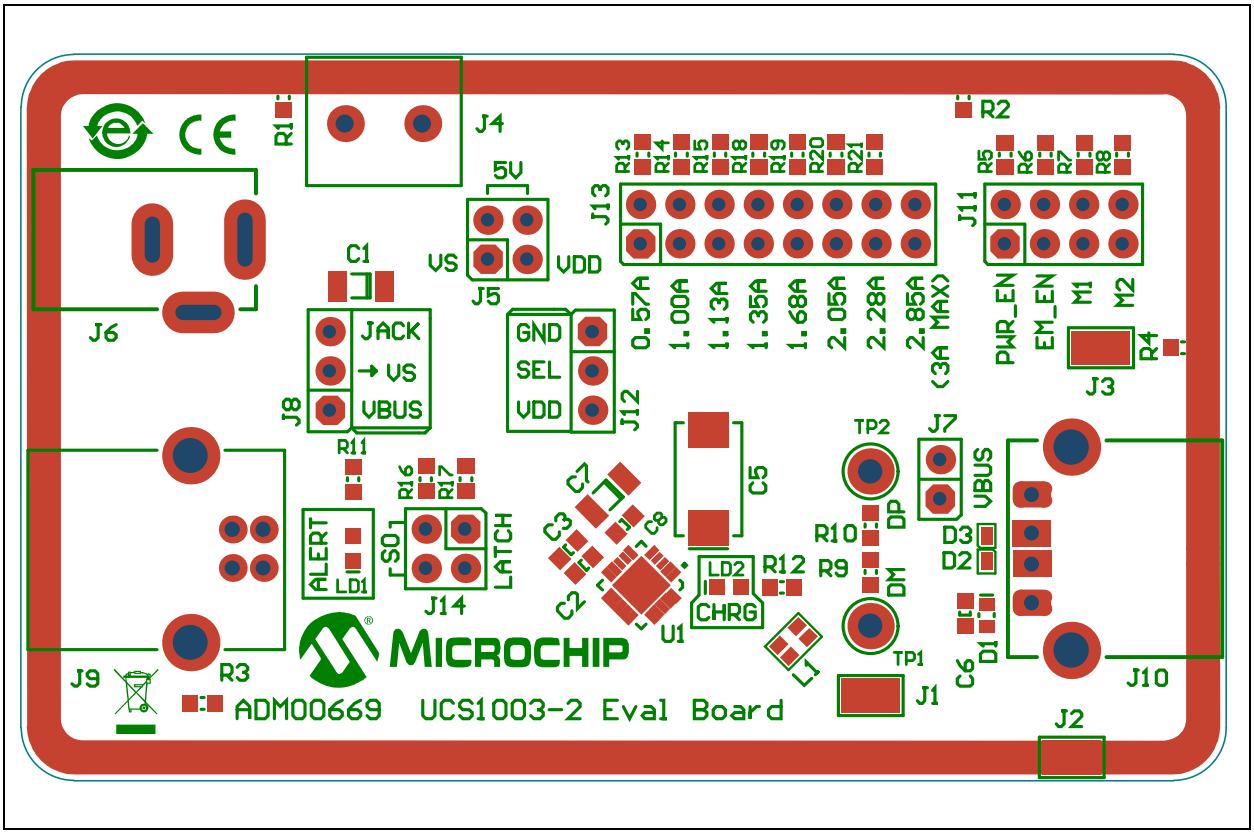
This appendix contains the following schematics and layouts for the UCS1003-2 Evaluation Board:

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

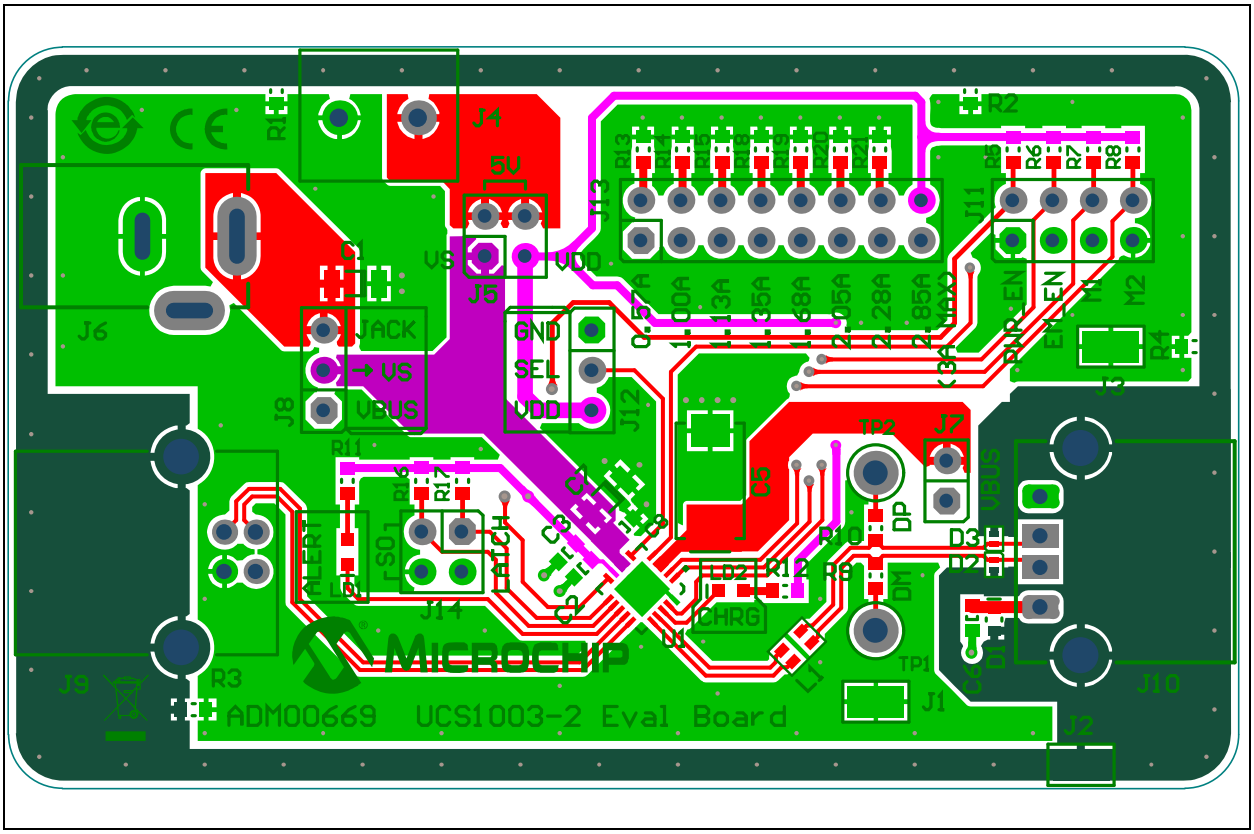
A.2 BOARD – SCHEMATIC



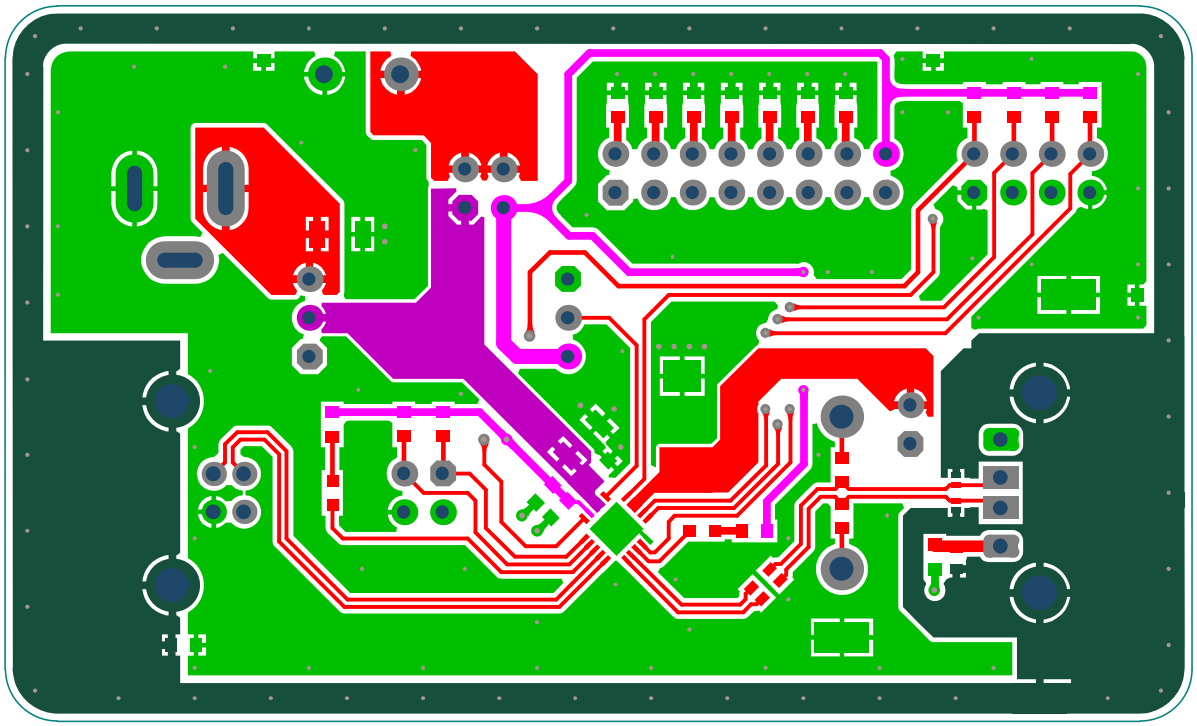
A.3 BOARD – TOP SILK



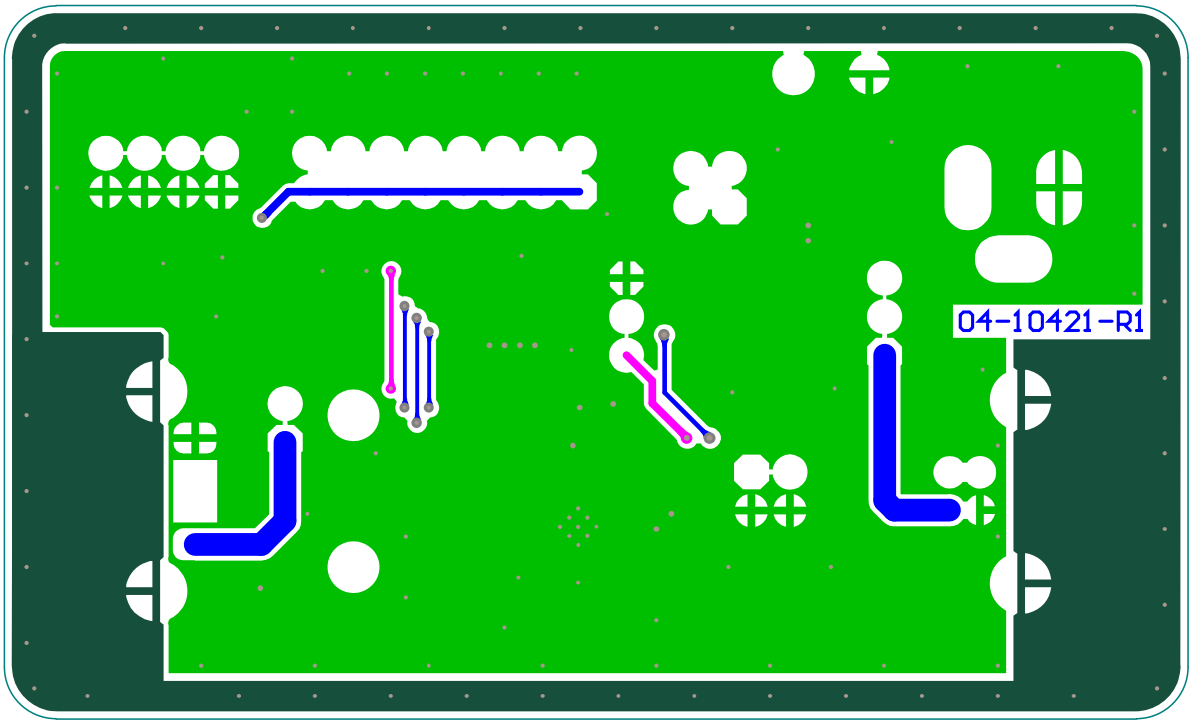
A.4 BOARD – TOP SILK AND COPPER



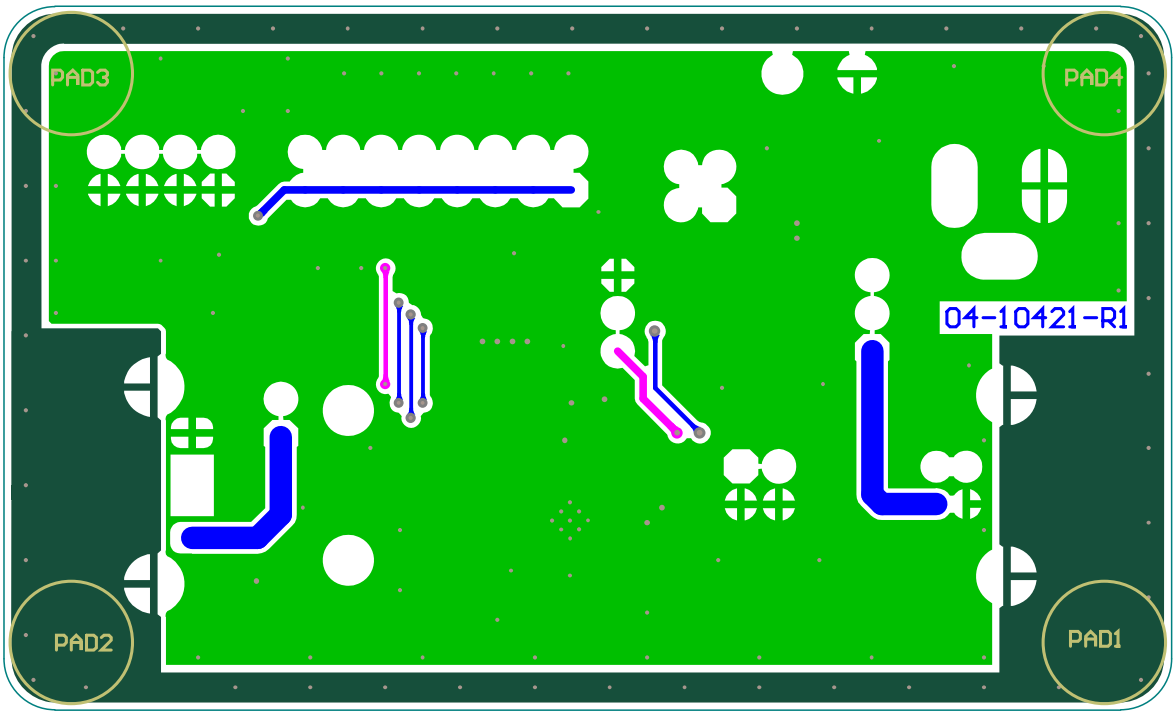
A.5 BOARD – TOP COPPER



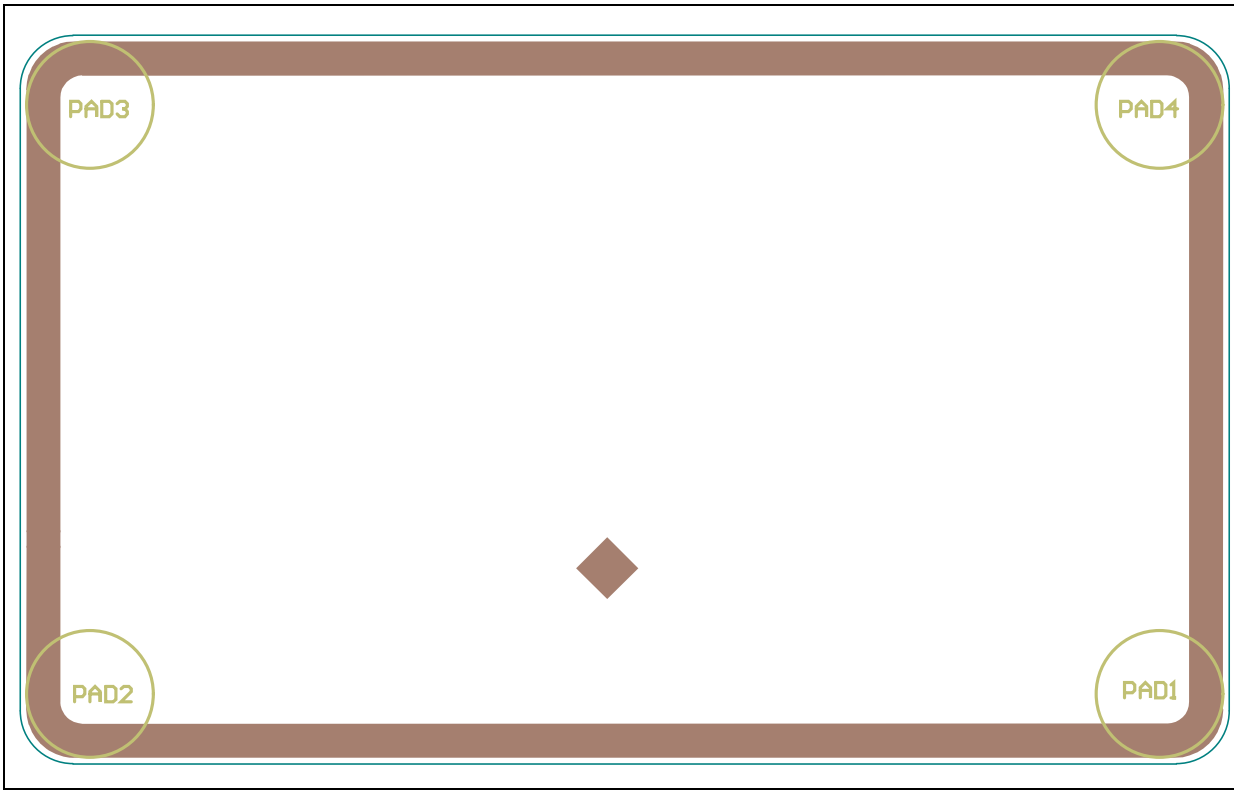
A.6 BOARD – BOTTOM COPPER



A.7 BOARD – BOTTOM SILK AND COPPER



A.8 BOARD – BOTTOM SILK



NOTES:

Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty.	Designator	Description	Manufacturer	Part Number
1	C1	Cap. Ceramic, 47 µF, 10V, 20%, X5R SMD, 1206	KEMET®	C1206C476M8PACTU
1	C2	Cap. Ceramic, 0.1 µF, 16V, 10%, X7R SMD, 0603	AVX Corporation	0603YC104KAT2A
1	C3	Cap. Ceramic, 1 µF, 25V, 10%, X7R SMD, 0603	TDK Corporation	C1608X7R1E105K
1	C5	Cap. Tantalum, 150 µF, 10V, 10%, 100m, SMD D	AVX Corporation	TPSD157K010R0100
1	C6	Cap. Ceramic, 470 pF, 50V, 10%, X7R SMD, 0603	Johanson Dielectrics	500R14W471KV4T
1	C7	Cap. Ceramic, 10 µF, 10V, 20%, X7R SMD, 1206	Murata	GRM31CR71A106KA01L
1	C8	Cap. Ceramic, 0.01 µF, 16V, 10%, X7R SMD, 0603	Samsung Electro-Mechanics America, Inc.	CL10B103KO8NNNC
1	D1	Diode Zener, T5V0S5-7, 5V, 150 mW, SMD, SOD-523	Diodes® Incorporated	T5V0S5-7
2	D2, D3	Diode Zener, PESD5V0X1BL, 5V, SMD, SOD-882	NXP Semiconductors	PESD5V0X1BL,315
3	J1, J2, J3	Conn. TP Loop, Tin, SMD	Harwin Plc.	S1751-46R
1	J4	Conn. Terminal, 5 mm, 18A, Female, 1x2 TH, R/A	Phoenix Contact	1935161
2	J5, J14	Conn. Header-2.54, Male, 2x2, Gold, 5.84 MH TH, Vertical	Samtec, Inc.	HTSW-102-07-G-D
1	J6	Conn. Power, 2.1 mm, 5.5 mm, Switch, TH, R/A	CUI Inc.	PJ-002A
1	J7	Conn. Header-2.54, Male, 1x2, Tin, 6.10 MH TH, Vertical	Molex®	0022284020
2	J8, J12	Conn. Header-2.54, Male, 1x3, Tin, 5.84 MH TH, Vertical	Samtec, inc.	TSW-103-07-T-S
1	J9	Conn. USB 2.0, STD-A, Female, TH, R/A	TE Connectivity, Ltd.	292304-1
1	J10	Conn. USB 2.0, STD-A, Female, TH, R/A	FCI	87520-0010BLF
1	J11	Conn. Header-2.54, Male, 2x4, Gold, 5.84 MH TH, Vertical	Samtec, inc.	TSW-104-08-L-D
1	J13	Conn. Header-2.54, Male, 2x8, Gold, 5.84 MH TH, Vertical	FCI	68602-116HLF
1	L1	Inductor Choke, Common Mode, 90k, 0805	Murata Electronics®	DLW21HN900SQ2L
1	LD1	Diode LED, Red, 1.95V, 30 mA, 700 mcd, Clear, SMD, 0603	Kingbright Corp.	APTD1608SURCK
1	LD2	Diode LED, Green, 2.2V, 25 mA, 15 mcd, Clear, SMD, 0603	Kingbright Corp.	APT1608SGC
1	PCB	UCS1001-3 – Printed Circuit Board	—	04-10421
4	R1, R2, R3, R4	Resistor TKF, 0R, 1/10W, SMD, 0603	NIC Components Corp.	NRC06Z0TRF

Note: 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.	Designator	Description	Manufacturer	Part Number
6	R5, R6, R7, R8, R16, R17	Resistor TKF, 10k, 5%, 1/10W, SMD, 0603	Panasonic® - ECG	ERJ-3GEYJ103V
2	R9, R10	Resistor TKF, 1M, 5%, 1/10W, SMD, 0603	Yageo Corporation	9C06031A1004JLHFT
2	R11, R12	Resistor TKF, 1k, 5%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3GEYJ102V
1	R13	Resistor TKF, 47k, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF4702V
1	R14	Resistor TKF, 56k, 1%, 1/10W, SMD, 0603	Stackpole Electronics, Inc.	RMCF0603FT56K0
1	R15	Resistor TKF, 68k, 1%, 1/10W, SMD, 0603	Stackpole Electronics, Inc.	RMCF0603FT68K0
1	R18	Resistor TKF, 82k, 1%, 1/10W, SMD, 0603	Panasonic Electronic Components	ERJ-3EKF8202V
1	R19	Resistor TKF, 100k, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1003V
1	R20	Resistor TKF, 120k, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1203V
1	R21	Resistor TKF, 150k, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1503V
1	TP1	Conn. TP Loop, Yellow, TH	Keystone Electronics Corp.	5014
1	TP2	Conn. TP Loop, White, TH	Keystone	5012
1	U1	Microchip Interface USB Power Switch, UCS1003-2-BP QFN-20	Microchip Technology Inc.	**UCS1003-2-BP**

Note: 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-2: BILL OF MATERIALS – MECHANICAL PARTS

Qty.	Designator	Description	Manufacturer	Part Number
1	ADAPTER1	Mechanical HW Adapter Interchangeable Blades Kit for Phihong R-series Wall Adapters	Phihong USA Inc.	RPBAG
10	JP1	Mechanical HW Jumper, 2.54 mm, 1x2, Handle Gold	TE Connectivity	881545-2
4	PAD1, PAD2, PAD3, PAD4	Mechanical HW Rubber Pad, Cylindrical, D7.9 H5.3, Black	3M	SJ61A11
1	PS1	Mechanical HW Power Supply, 5V, 3A, DC, 2.1 mm	Phihong USA Inc.	PSA15R-050PV

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.

NOTES:

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