# UCS1001-3
# Evaluation Board
# User's Guide

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## QUALITY MANAGEMENT  SYSTEM
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# ═ ISO/TS 16949 ═

# UCS1001-3 EVALUATION BOARD USER'S GUIDE

# Table of Contents

**Object of Declaration: UCS1001-3 Evaluation Board User's Guide**

EU Declaration of Conformity

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.
For information regarding the exclusive, limited warranties applicable to Microchip products, please see Microchip's standard terms and conditions of sale, which are printed on our sales documentation and available at www.microchip.com.
Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA
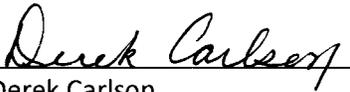
Derek Carlson
VP Development Tools

16-July-2013
Date

**NOTES:**

# UCS1001-3 EVALUATION BOARD USER'S GUIDE

# 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 UCS1001-3. 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 UCS1001-3 as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

• **Chapter 1. "Product Overview"** – Important information about the UCS1001-3 Evaluation Board.
• **Chapter 2. "Installation and Operation"** – Includes instructions on installing and getting started with the UCS1001-3 Evaluation Board.
• **Chapter 3. "Hardware Overview"** – Shows hardware details of the UCS1001-3 Evaluation Board.
• **Appendix A. "Schematics and Layouts"** – Shows the schematic and layout diagrams for the UCS1001-3 Evaluation Board.
• **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the UCS1001-3 Evaluation Board.

# UCS1001-3 Evaluation Board User's Guide

## 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)` <br> `{ ...` <br> `}` |

## RECOMMENDED READING

This user's guide describes how to use UCS1001-3. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **UCS1001-3 Data Sheet –** *"USB Port Power Controller with Charger Emulation"* **(Revision 1.4 – 07-16-13)**
- **AN 24.20 –** *"Using the UCS100x as a Single or Dual Mode Charger"* **(Revision 1.0)**
- **AN 25.16 –** *"USB Charging Port ESD Protection Tips for UCS100x"* **(Revision 1.0)**
- **AN 26.0 –** *"UCS1001 Current Limit Operation and Features"* **(Revision 1.1)**

## THE MICROCHIP WEB SITE

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- **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
- **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

## 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 (November 2013)

- Initial Release of this Document.

**NOTES:**

# Chapter 1. Product Overview

## 1.1 INTRODUCTION

The UCS1001-3 device is a Universal Serial Bus (USB) port power switch with charger emulation. All of the functions of the UCS1001-3 device can be tested and observed with the UCS1001-3 Evaluation Board. A block diagram of this evaluation board Charger Emulation Test Set Up is shown in Figure 1-1.
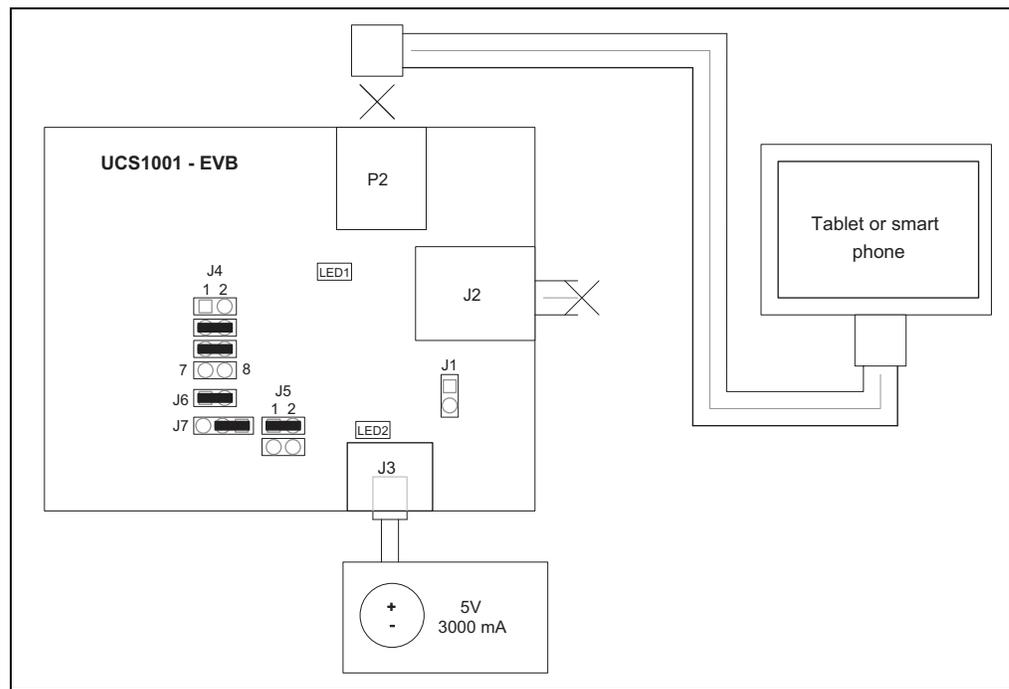


**FIGURE 1-1:**     *UCS1001-3 Evaluation Board – Charger Emulation Test Set Up Block Diagram.*

## 1.2 EVALUATION SYSTEM FEATURES

The evaluation setup is comprised of the UCS1001-3 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 2.5 or 0.5A
• Jumper for PWR_EN

### 1.2.1 Board Component Location

The evaluation board was designed for ease of use and user experimentation. Figure 1-2 below shows the top-printed circuit board 3D plot for the UCS1001-3 Evaluation Board.
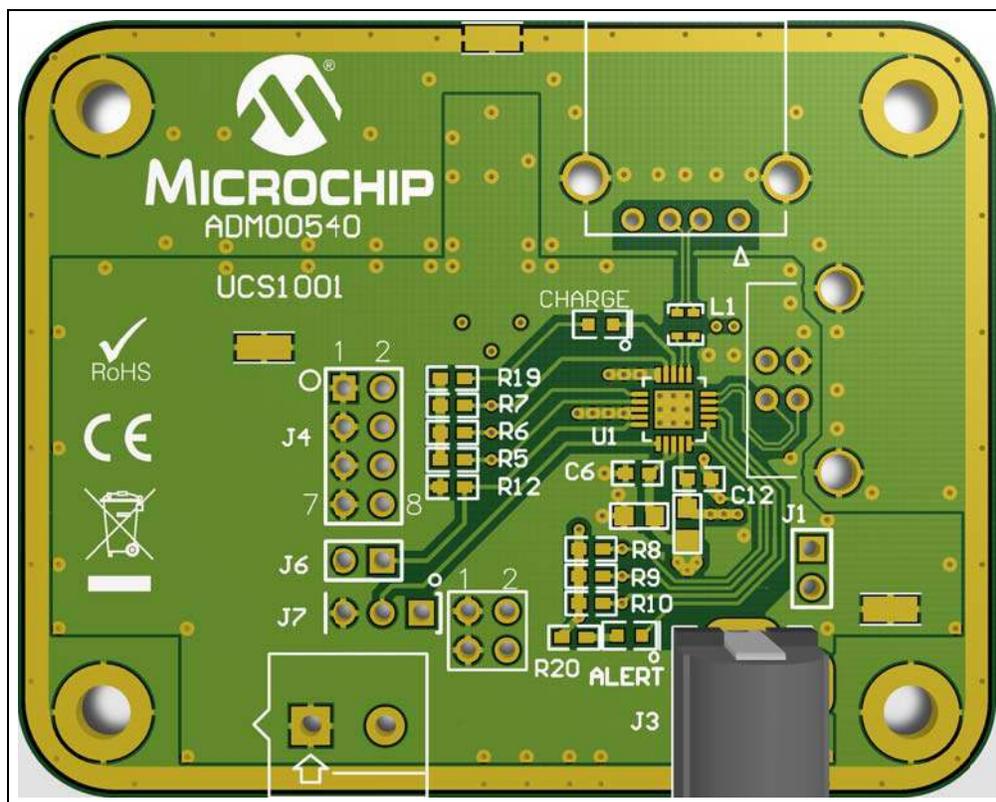


**FIGURE 1-2:** *UCS1001-3 Evaluation Board – Top 3D View.*

## 1.3 WHAT THE UCS1001-3 EVALUATION BOARD KIT CONTAINS

This UCS1001-3 Evaluation Board kit includes:

- UCS1001-3 Evaluation Board (ADM00540)
- Provided 20W, 5V wall power adapter
- Important Information Sheet

# Chapter 2. Installation and Operation

## 2.1  GETTING STARTED

### 2.1.1  System Requirements

To use the UCS1001-3 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 an 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. Refer to Figure 2-1 for the jumper location.

**TABLE 2-1:     UCS1001-3 EVB JUMPER DESCRIPTION**

| Jumper Designator | Pin Name | Function Description |
|---|---|---|
| J4: 1-2 | EM_EN | Jumper placed = Logic Low |
| J4: 3-4 | M1 | |
| J4: 5-6 | M2 | |
| J4: 7-8 | PWR_EN | |
| J6: 1-2 | ILIM | Jumper placed = Logic High: 2.5A Current Limit<br>Jumper open = 47K Pull Down: 0.5A Current Limit |
| J7: 1-2 | SEL | Jumper placed = Logic High: PWR_EN is Active High |
| J7: 2-3 | | Jumper placed = Logic Low: PWR_EN is Active Low |
| J5: 1-2 | LATCH | Jumper placed = Logic Low: LATCH = 0, Auto-recovery enabled<br>Jumper open = Logic High: LATCH = 1, Auto-recovery disabled |
| J5: 3-4 | S0 | Jumper placed = Logic Low: S0 = 0, Active mode<br>Jumper open = Logic High: S0 = 1, Detect mode |
| J1: 1-2 | USB Power | This jumper is to be left OPEN so that $V_{DD}$ and $V_{SOURCE}$ can be sourced from J3. |
| J3 | $V_{DD}$ and $V_S$ | Power supply for $V_{DD}$ and $V_{SOURCE}$ |
| J8 | Not Used | Not populated. Optional for Split Rail supply use. |
| J2 | USB-B | USB port for Host PC |
| P2 | USB-A | USB port for Downstream Device |

# UCS1001-3 Evaluation Board User's Guide
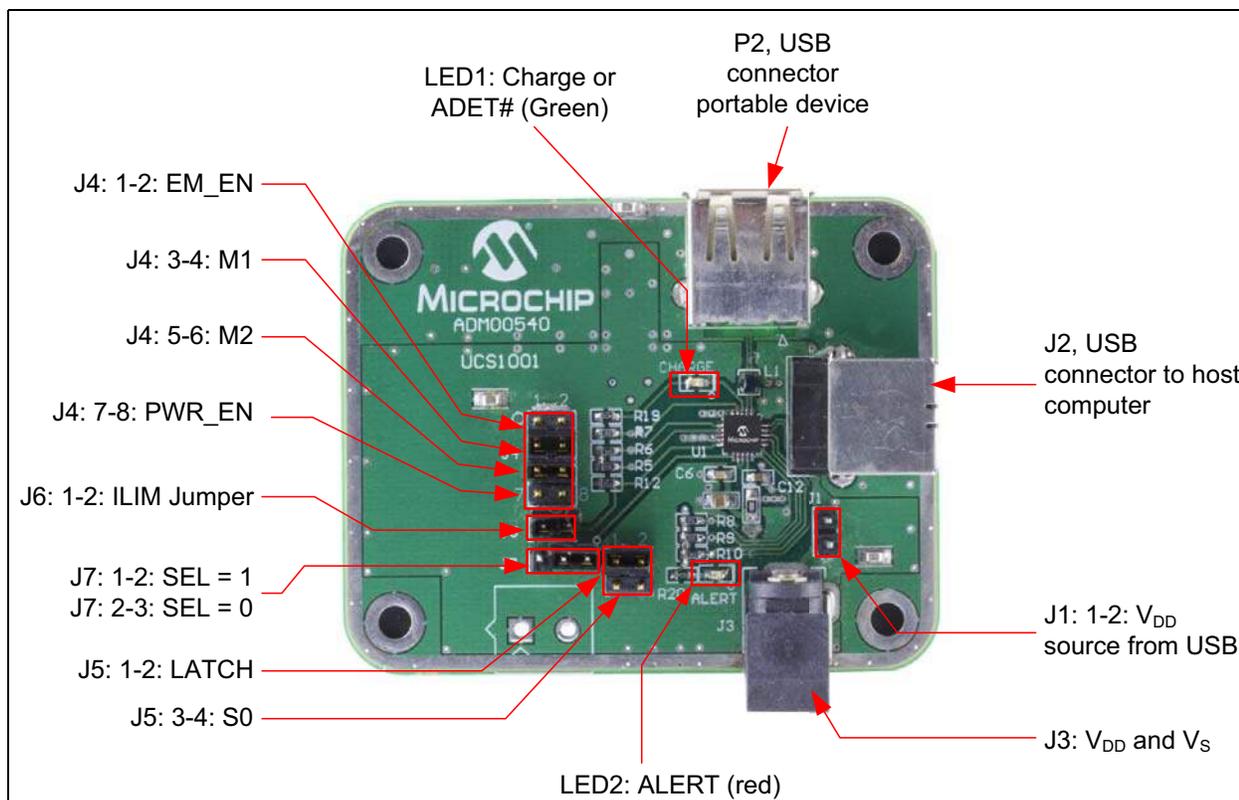


**FIGURE 2-1:** *UCS1001-3 Evaluation Board Jumper Location.*

### 2.1.3 Configuration for Dedicated Charger Emulation (DCE) Mode

The Dedicated Charger Emulation (DCE) mode configures the UCS1001-3 Evaluation Board to cycle through emulation profiles until $I_{BUS\_CHG}$ increases above the threshold of 156 mA. To configure the evaluation board for DCE:

1. Configure the jumper settings as shown in Table 2-2.
2. Apply 5V to J3.
3. The UCS1001-3 is set for the DETECT state and awaits a downstream device attachment.

Connect a tablet or a cell phone to the USB port P2. When a Charger Emulation Profile is applied and IBUS_CHG increases above 156 mA, LED1 will illuminate and charging will continue.

**TABLE 2-2: UCS1001-3 EVALUATION BOARD JUMPER SETTINGS FOR DCE MODE**

| Jumper Designator | Pin Name | Function Description |
|---|---|---|
| J4: 1-2 | EM_EN | OPEN: Logic High |
| J4: 3-4 | M1 | SHORT: Logic Low |
| J4: 5-6 | M2 | SHORT: Logic Low |
| J4: 7-8 | PWR_EN | OPEN: Logic High |
| J6: 1-2 | ILIM | SHORT: Logic High – 2.5A Current Limit |
| J7: 1-2 | SEL | SHORT: Logic High – PWR_EN is Active High |
| J5: 1-2 | LATCH | SHORT: Logic Low – LATCH = 0, Auto-recovery enabled |
| J5: 3-4 | S0 | OPEN: Logic High – S0 = 1, Detect mode |

### 2.1.4    Configuration for BC1.2 CDP mode

The Charging Downstream Port (CDP) mode configures the UCS1001-3 Evaluation Board to Handshake response, Enumerate the USB, and charge the downstream device. To configure the evaluation board for CDP:

1. Configure the jumper settings as shown in Table 2-3.
2. Apply 5V to J3.
3. Connect the EVB J2 (USB-B) to an Upstream PC USB port.
4. The UCS1001-3 is set for ACTIVE state and awaits a downstream device to provide Handshake stimulus on the DP pin upon attachment.

**TABLE 2-3:    UCS1001-3 EVALUATION BOARD JUMPER SETTINGS FOR CDP MODE**

| Jumper Designator | Pin Name | Function Description |
|---|---|---|
| J4: 1-2 | EM_EN | OPEN: Logic High |
| J4: 3-4 | M1 | OPEN: Logic High |
| J4: 5-6 | M2 | OPEN: Logic High |
| J4: 7-8 | PWR_EN | OPEN: Logic High |
| J6: 1-2 | ILIM | SHORT: Logic High – 2.5A Current Limit |
| J7: 1-2 | SEL | SHORT: Logic High – PWR_EN is Active High |
| J5: 1-2 | LATCH | SHORT: Logic Low – LATCH = 0, Auto-recovery enabled |
| J5: 3-4 | S0 | SHORT: Logic Low – S0 = 0, Active mode |

Connect a BC1.2-compliant device to the USB Port P2. Once the handshaking response and stimulus are complete, the USB will Enumerate and the downstream device will charge.

### 2.1.5    Configuration for BC1.2 DCP mode

The Dedicated Charging Port (DCP) mode configures the UCS1001-3 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 DCP:

1. Configure the jumper settings as shown in Table 2-4.
2. Apply 5V to J3.
3. The UCS1001-3 is set for ACTIVE state and awaits a downstream device to Handshake upon attachment.

**TABLE 2-4:    UCS1001-3 EVALUATION BOARD JUMPER SETTINGS FOR DCP MODE**

| Jumper Designator | Pin Name | Function Description |
|---|---|---|
| J4: 1-2 | EM_EN | OPEN: Logic High |
| J4: 3-4 | M1 | SHORT: Logic Low |
| J4: 5-6 | M2 | OPEN: Logic High |
| J4: 7-8 | PWR_EN | OPEN: Logic High |
| J6: 1-2 | ILIM | SHORT: Logic High – 2.5A Current Limit |
| J7: 1-2 | SEL | SHORT: Logic High – PWR_EN is Active High |
| J5: 1-2 | LATCH | SHORT: Logic Low – LATCH = 0, Auto-recovery enabled |
| J5: 3-4 | S0 | SHORT: Logic Low – S0 = 0, Active mode |

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### 2.1.6 Configuration for BC1.2 SDP mode

The Standard Downstream Port (SDP) mode configures the UCS1001-3 Evaluation Board to close the High-Speed Switch and allow the USB to Enumerate. To configure the evaluation board for SDP:

1. Configure the Jumper settings as shown in Table 2-5 below.
2. Apply 5V to J3.
3. Connect the evaluation board J2 (USB-B) to an upstream PC USB port.
4. The UCS1001-3 is set for ACTIVE state and awaits a downstream device to Enumerate the USB upon attachment.

**TABLE 2-5:    UCS1001-3 EVALUATION BOARD JUMPER SETTINGS FOR SDP MODE**

| Jumper Designator | Pin Name | Function Description |
|---|---|---|
| J4: 1-2 | EM_EN | SHORT: Logic Low |
| J4: 3-4 | M1 | OPEN: Logic High |
| J4: 5-6 | M2 | SHORT: Logic Low |
| J4: 7-8 | PWR_EN | OPEN: Logic High |
| J6: 1-2 | ILIM | SHORT: Logic High – 2.5A Current Limit |
| J7: 1-2 | SEL | SHORT: Logic High – PWR_EN is Active High |
| J5: 1-2 | LATCH | SHORT: Logic Low – LATCH = 0, Auto-recovery enabled |
| J5: 3-4 | S0 | SHORT: Logic Low – S0 = 0, Active mode |

# Chapter 3. Hardware Overview

## 3.1    INTRODUCTION

The UCS1001-3 Evaluation Board provides the means to demonstrate all of the UCS1001-3 functionality. The LEDs indicate the status information.

### 3.1.1    Power Source

The UCS1001-3 Evaluation Board requires 5V, 3.0A.

## 3.2    STAND-ALONE FUNCTIONALITY

The UCS1001-3 is intended for Stand-Alone USB Charger and BC1.2 CDP, DCP and SDP applications. See Table 2-1 for the description of jumpers.

LED1 indicates that the $I_{BUS\_CHG}$ has exceeded the 156 mA threshold.

### 3.2.1    Charger Emulation Mode Configurations

The Charger Emulation mode of the UCS1001-3 is controlled by the pin states M1, M2 and EM_EN. These are the jumpers located on J4.

### 3.2.2    Attach Detection and Power States

The UCS1001-3 can use the Attach Detection functionality, or force the Active Mode Power State. This is controlled by jumper J5.

## 3.3    FAULT HANDLING

The UCS1001-3 has two modes of Fault Handling that can be configured for LATCH upon fault or Auto-recovery. Jumper J5 selects the Fault Handling. See Table 2-1 for the description of jumpers.

## 3.4    CURRENT LIMITING

The UCS1001-3 is capable of eight selectable current limits (see UCS1001-3's data sheet for detailed information).

The UCS1001-3 Evaluation Board can be configured for MAX (2.5A) or MIN (0.5A) Current Limiting. Jumper J6 selects the MIN or MAX Current Limiting. See Table 2-1 for the description of jumpers.

## 3.5    HIGH SPEED USB DATA SWITCH

The UCS1001-3 contains a series USB 2.0-compliant high-speed switch between the DP and DM input and output pins. This switch is functional in CDP, SDP and Pass-through configurations.

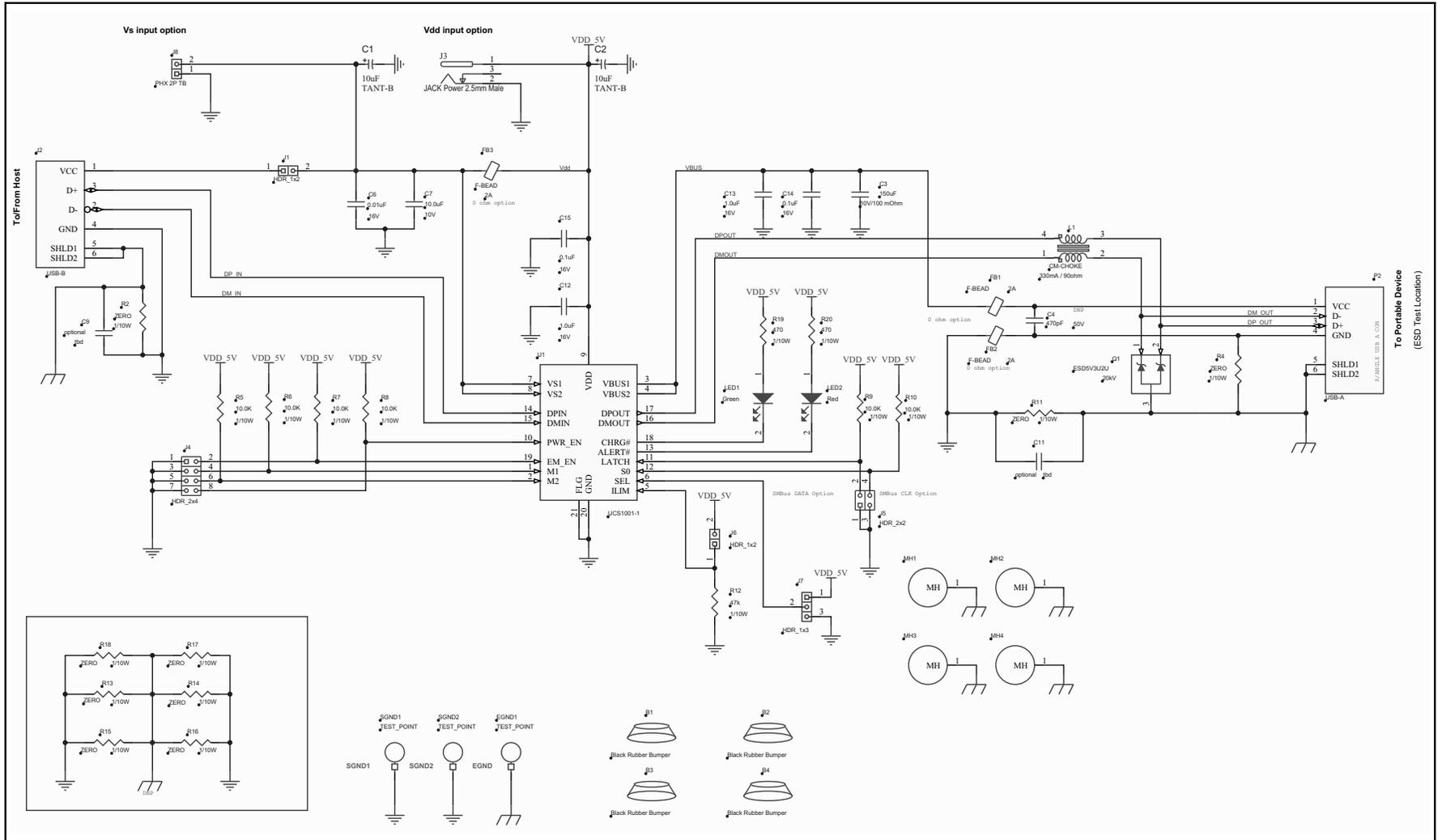**NOTES:**

# Appendix A. Schematics and Layouts
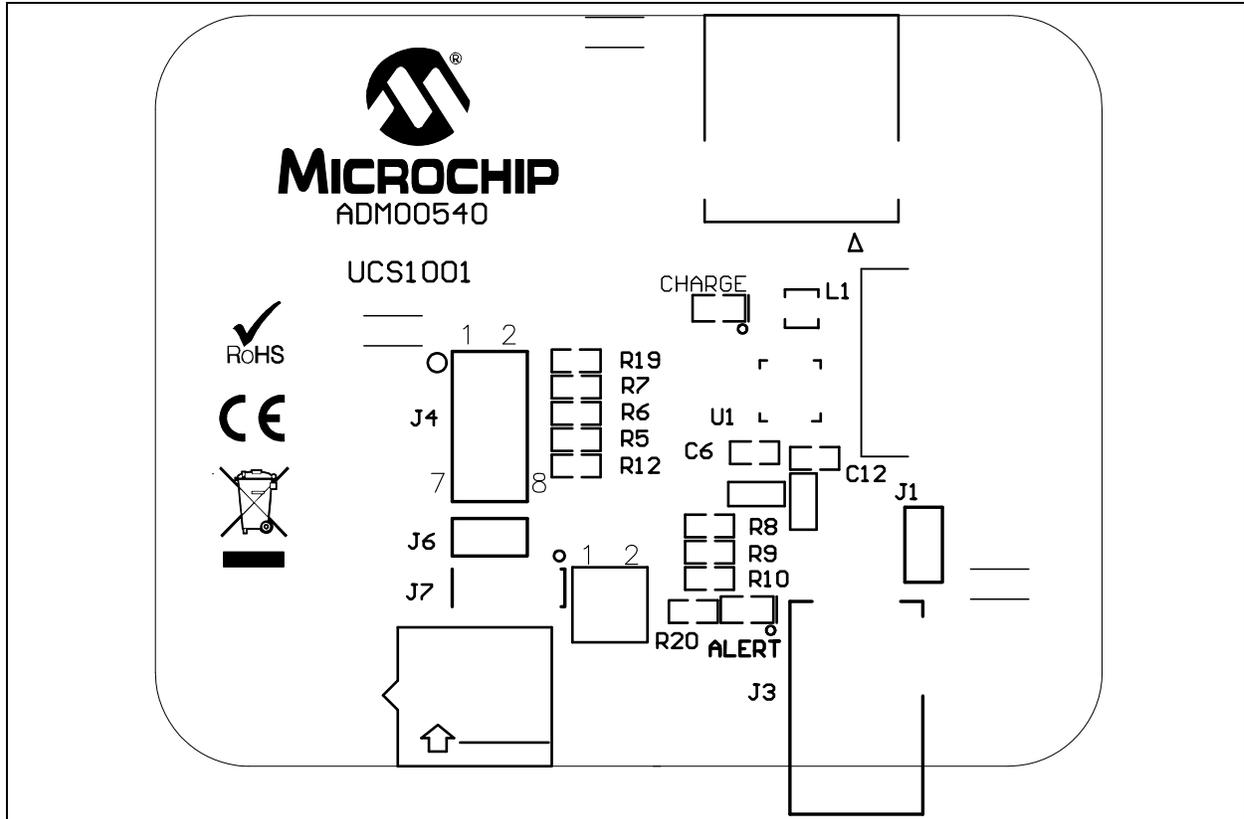
## A.1    INTRODUCTION

This appendix contains the following schematics and layouts for the UCS1001-3 Evaluation Board:

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

# A.2    BOARD – SCHEMATIC

**UCS1001-3 Evaluation Board User's Guide**

Vs input option

Vdd input option

VDD_5V

C1
10uF
TANT-B

J8
2
1
PHX 2P TB

J3
1
2
JACK Power 2.5mm Male

C2
10uF
TANT-B

To/From Host

J2
VCC          1
D+
D-
GND          4
SHLD1        5
SHLD2        6
USB-B

J1
1    2
HDR_1x2

C6
0.01uF
16V

C7
10.0uF
10V

FB3
F-BEAD
2A
0 ohm option

Vdd

VBUS

C13
0.1uF
16V

C14
0.1uF
16V

C3
50uF
10V/100 mOhm

DPOUT

DMOUT

L1
4    3
R
1    2
R
CM-CHOKE
330mA / 90ohm

DP_IN

DM_IN

C9
optional
bd

R2
ZERO
1/10W

C15
0.1uF
16V

C12
0.1uF
16V

FB1
F-BEAD     2A
0 ohm option

C4
DNP
70pF
50V

DM_OUT

DP_OUT

To Portable Device
(ESD Test Location)

P2
VCC          1
D-           2
D+           3
GND          4
SHLD1        5
SHLD2        6
USB_A_CON

VDD_5V  VDD_5V  VDD_5V  VDD_5V

R5        R6        R7        R8
10.0K     10.0K     10.0K     10.0K
1/10W     1/10W     1/10W     1/10W

J4
1    2
3    4
5    6
7    8
HDR_2x4

VDD_5V  VDD_5V

R19       R20
470       470
1/10W     1/10W

LED1
Green

LED2
Red

VDD_5V  VDD_5V

R9        R10
10.0K     10.0K
1/10W     1/10W

FB2
F-BEAD     2A
0 ohm option

Q1
ESD5V3U2U
20kV

R11
ZERO
1/10W

R4
ZERO
1/10W

C11
optional
bd

J1          UCS1001-1
VS1    7         3    VBUS1
VS2    8         4    VBUS2
DPIN   14       17    DPOUT
DMIN   15       16    DMOUT
PWR_EN 10       18    CHRG#
EM_EN  19       13    ALERT#
M1      1       11    LATCH
M2      2       12    S0
                 5    SEL
FLG GND          ILIM
    21  20

SMBus DATA Option

J6
2
1
HDR_1x2

VDD_5V

R12
47k
1/10W

SMBus CLK Option

J5
1  2
3  4
HDR_2x2

J7
2    1
3
HDR_1x3

VDD_5V

MH1       MH2
MH         MH

MH3       MH4
MH         MH

R18       R17
ZERO      ZERO
1/10W     1/10W

R13       R14
ZERO      ZERO
1/10W     1/10W

R15       R16
ZERO      ZERO
1/10W     1/10W

DGND

SGND1
TEST_POINT

SGND2
TEST_POINT

EGND1
TEST_POINT

SGND1   SGND2   EGND

B1
Black Rubber Bumper

B2
Black Rubber Bumper

B3
Black Rubber Bumper

B4
Black Rubber Bumper

## A.3    BOARD – TOP SILK



## A.4    BOARD – TOP SILK AND PADS
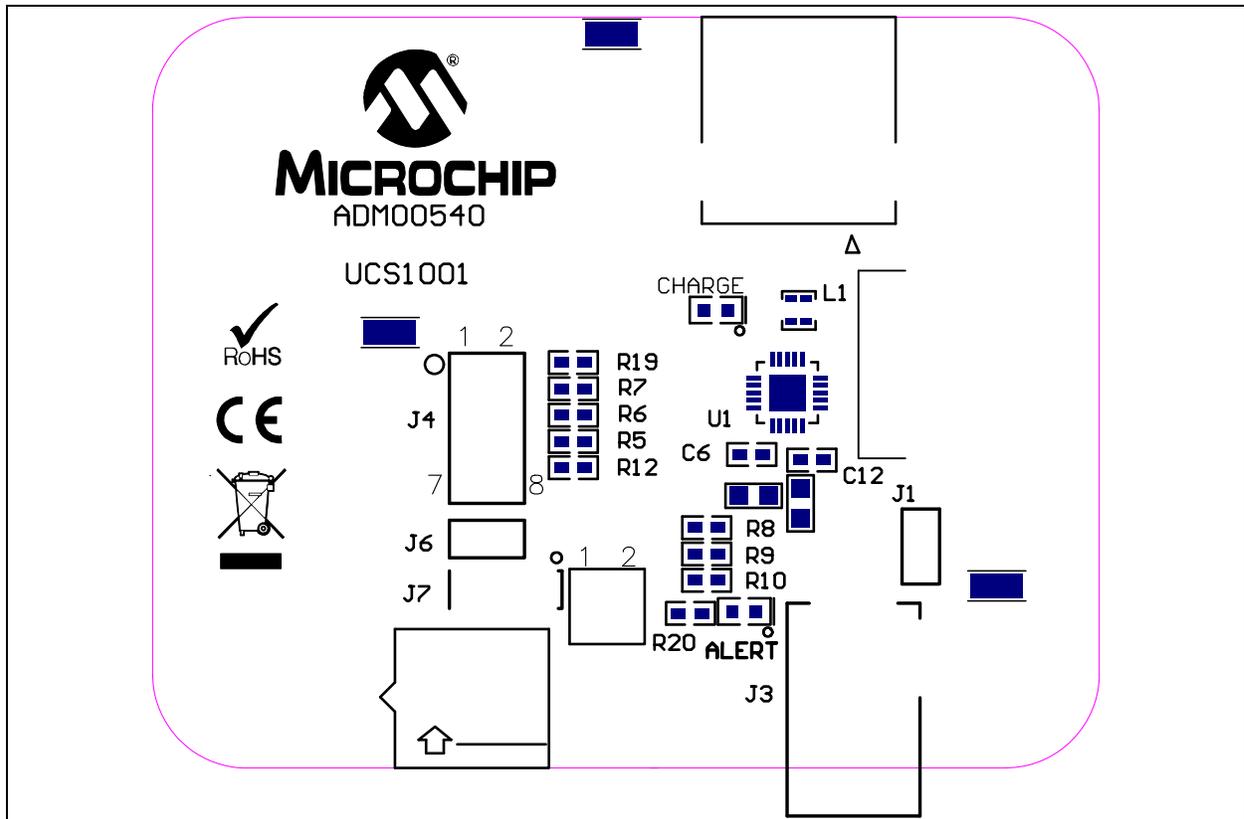
## A.5     BOARD – TOP SILK AND COPPER
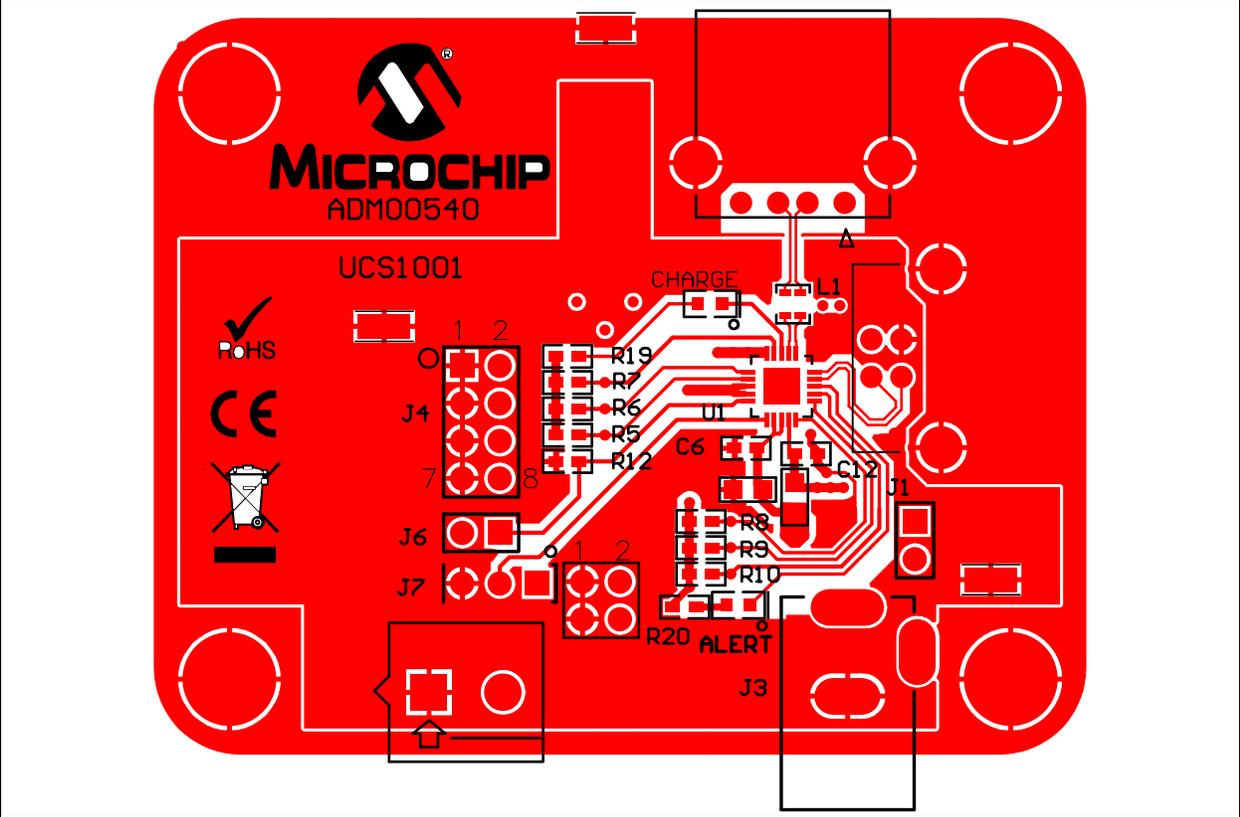


## A.6     BOARD – TOP COPPER
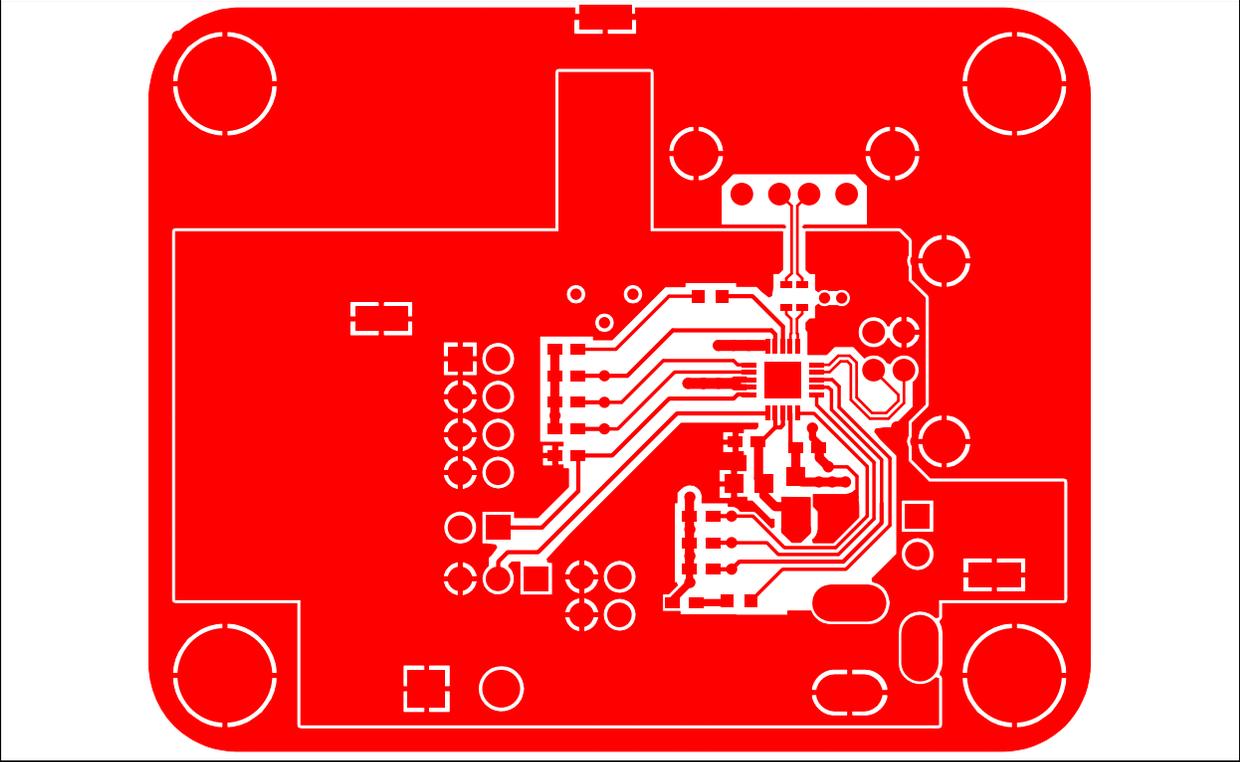
## A.7    BOARD – BOTTOM COPPER



## A.8    BOARD – BOTTOM SILK AND COPPER
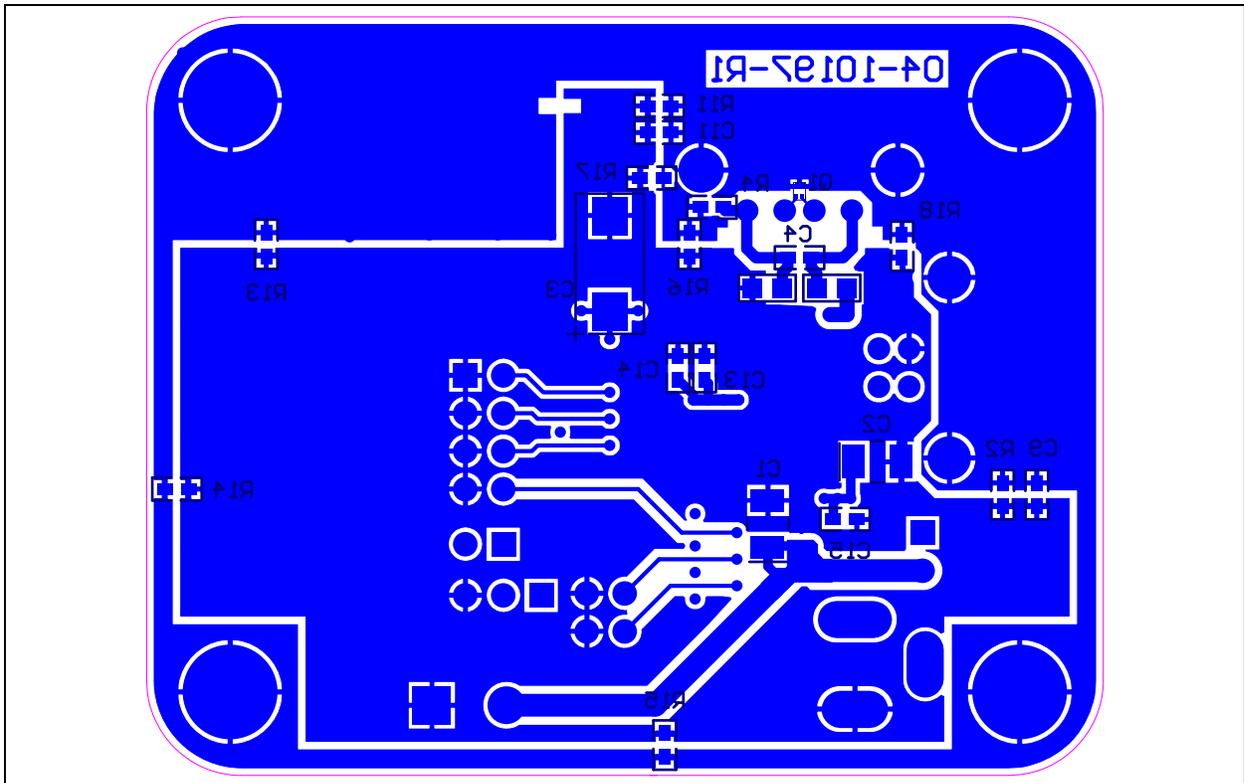
## A.9 BOARD – BOTTOM SILK AND PADS
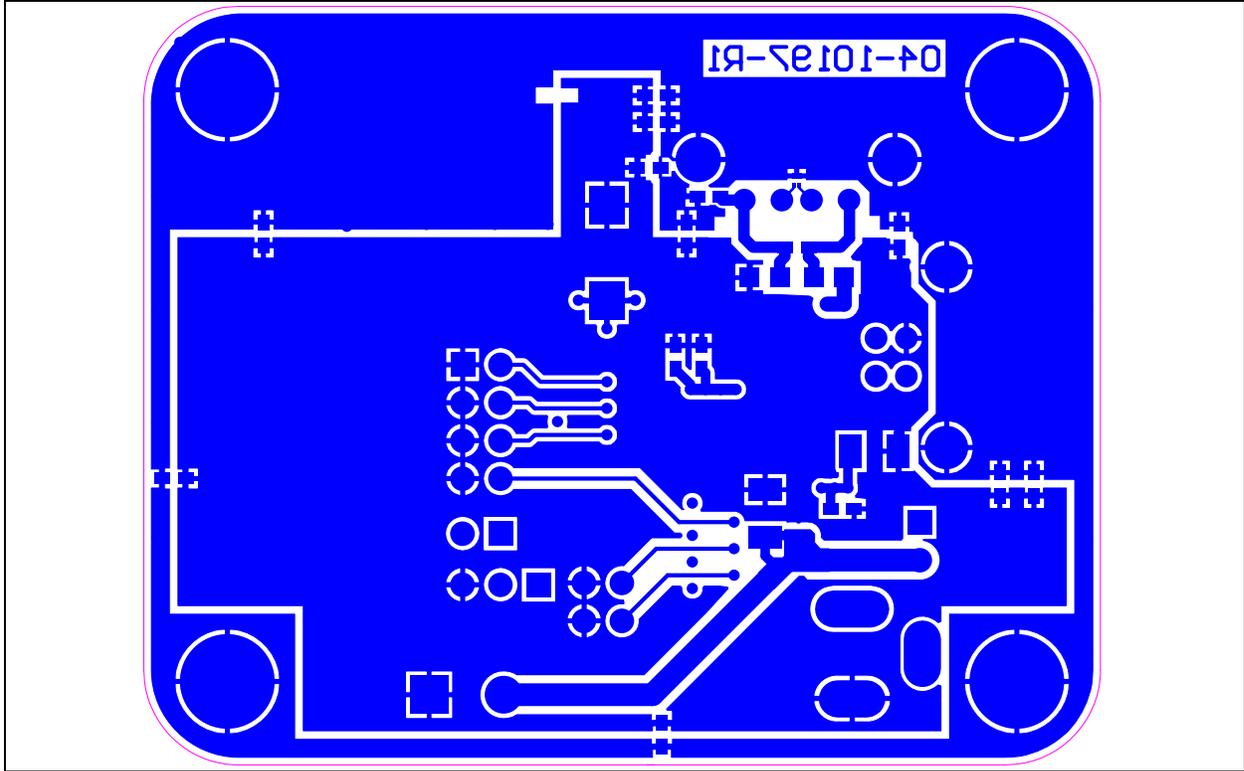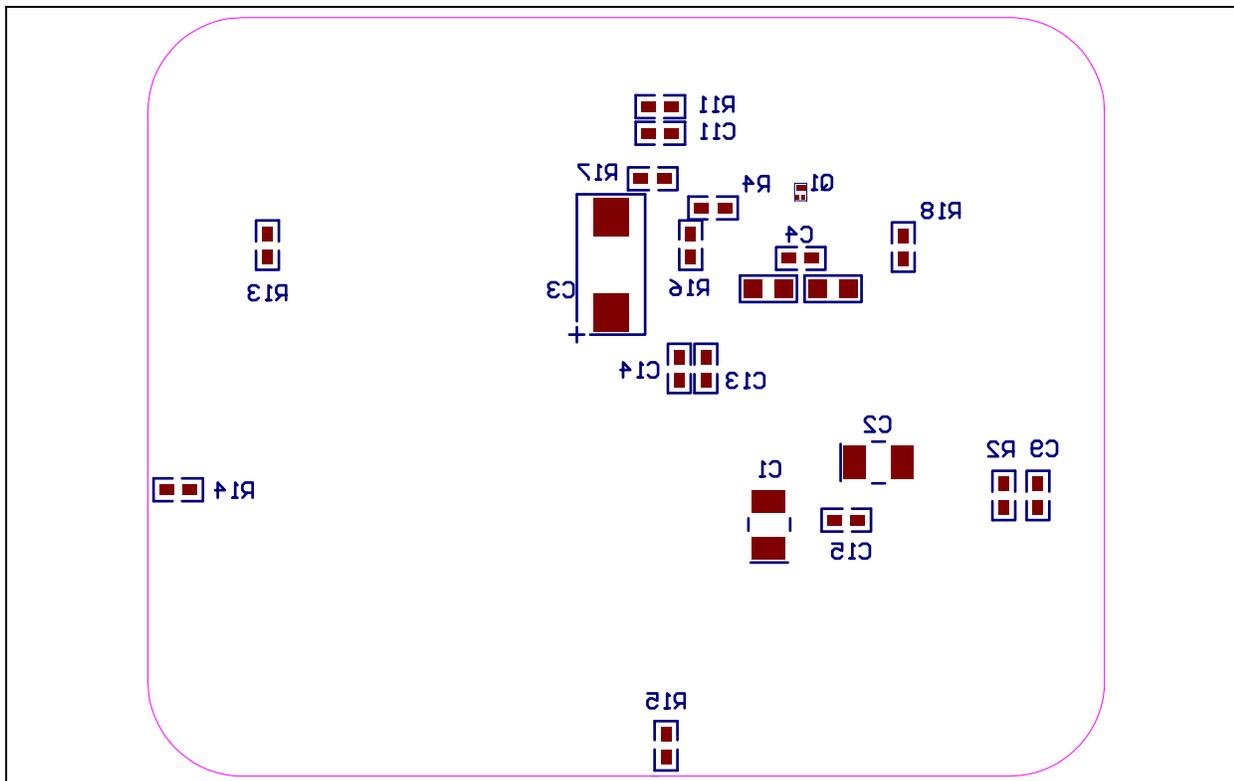


## A.10 BOARD – BOTTOM SILK
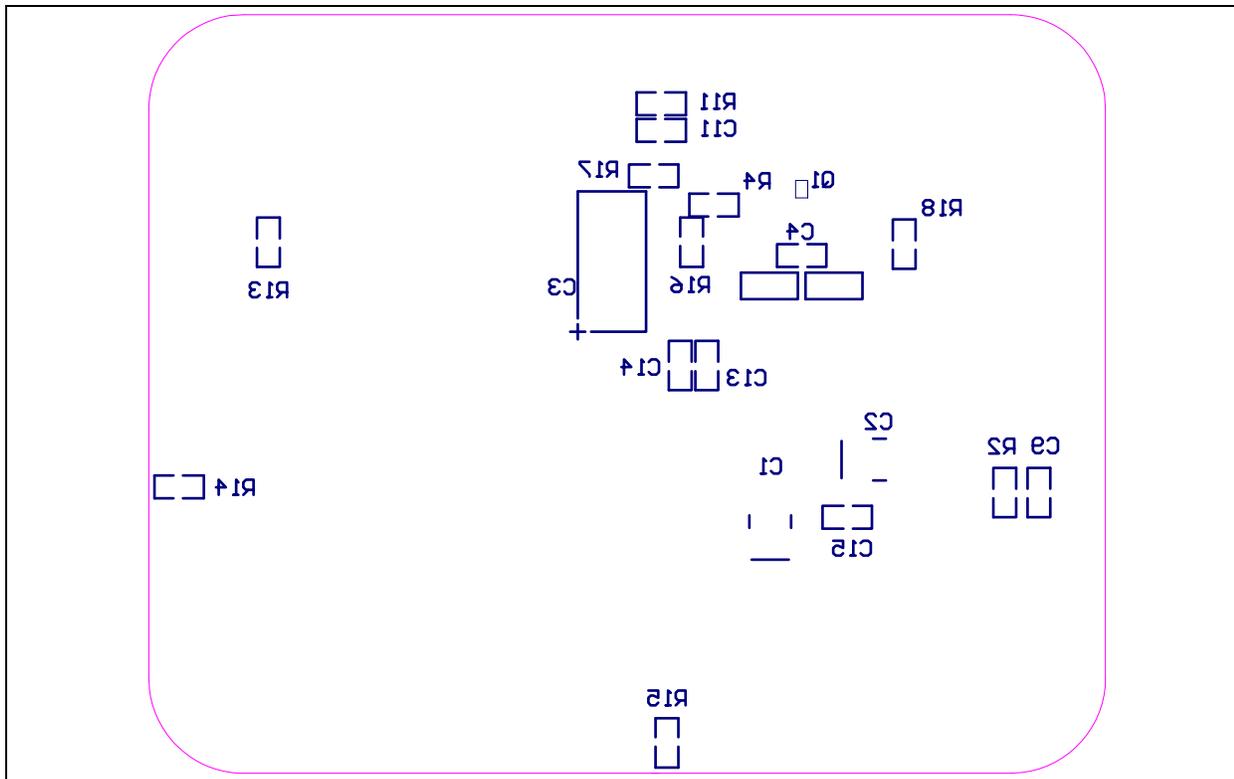
# Appendix B. Bill of Materials (BOM)

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

| Qty. | Designator | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 2 | C1, C2 | Cap. tant. 10 µF 20V 10% 1210 | AVX Corporation | TAJB106K020RNJ |
| 1 | C3 | Cap. tant. 150 µF 10V 10% 2917 | AVX Corporation | TPSD157K010R0100 |
| 1 | C4 | Cap. ceramic 470 PF 50V 10% X7R 0603 | Murata Electronics® | GRM188R71H471KA01D |
| 1 | C6 | Cap. ceramic 10000 PF 50V 10% X7R 0603 | Yageo Corporation | CC0603KRX7R9BB103 |
| 1 | C7 | Cap. ceramic 10 µF 10V 10% X7R 0805 | Murata Electronics | GRM21BR71A106KE51 |
| 0 | C9, C11 | **DO NOT POPULATE** | — | — |
| 2 | C12, C13 | Cap. ceramic 1 µF 16V 10% X5R 0603 | Yageo Corporation | CC0603KRX5R7BB105 |
| 2 | C14, C15 | Cap. ceramic 0.1 µF 16V 10% X7R 0603 | Yageo Corporation | CC0603KRX7R7BB104 |
| 3 | EGND1, SGND1, SGND2 | PC test point miniature SMT | Keystone Electronics Corp. | 5015 |
| 3 | FB1, FB2, FB3 | Res. 0.0 OHM 1/8W jump. 0805 SMD | Panasonic® - ECG | ERJ-6GEY0R00V |
| 2 | J1, J6 | Conn. header 2 pos. .100 vert. tin | FCI | 77311-118-02LF |
| 1 | J2 | Conn. USB recept. R/A type B 4 pos. | TE Connectivity, Ltd. | 292304-1 |
| 1 | J3 | Conn. power jack male 2.5 MM clsd. | CUI Inc. | PJ-002B |
| 1 | J4 | Conn. header 8 pos. 2 x 4 .100 str. 30 gold | FCI | 68602-108HLF |
| 1 | J5 | Conn. header 4 pos. .100" dual gold | FCI | 68602-204HLF |
| 1 | J7 | Conn. header 3 pos. .100 vert. tin | Molex® | 0022284030 |
| 1 | J8 | Conn. term. block 2 pos. 5 MM PCB | Phoenix Contact GmbH & Co. | 1729018 |
| 7 | Jumper shunts | Shunt LP w/handle 2 pos. 30 gold | TE Connectivity, Ltd. | 881545-2 |
| 1 | L1 | Choke common mode 90 OHM 0805 | Murata Electronics | DLW21HN900SQ2L |
| 1 | LED1 | LED pure green 0603 SMD | Stanley Electric Co., Ltd. | BG1111C-TR |
| 1 | LED2 | LED red clear 0603 SMD | Lite-On® Technology Corp. | LTST-C190CKT |
| 1 | P2 | Conn. rcpt. USB type A R/A PCB | FCI | 87520-0010BLF |
| 0 | PCB | Printed Circuit Board - UCS1001-3 Evaluation Board | — | 104-00540 |
| 1 | Q1 | Diode ESD array 5.3V TSLP-3-7 | Infineon Technologies AG | ESD5V3U2U-03LRH E6327 |
| 8 | R2, R11, R13, R14, R15, R16, R17, R18 | Res. 0.0 ohm 1/10 W jump. 0603 SMD | Yageo Corporation | RC0603JR-070RL |
| 1 | R4 | Res. 0.0 ohm 1/10W jump. 0603 SMD | Panasonic - ECG | ERJ-3GEY0R00V |

**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. | Designator | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 6 | R5, R6, R7, R8, R9, R10 | Res. 10.0K ohm 1/10W 1% 0603 SMD | Yageo Corporation | RC0603FR-0710KL |
| 1 | R12 | Res. 47K ohm 1/10W 1% 0603 | Stackpole Electronics, Inc. | RMCF0603FT47K0 |
| 2 | R19, R20 | Res. 470 ohm 1/10W 5% 0603 SMD | Yageo Corporation | RC0603JR-07470RL |
| 1 | U1 | UCS1001-3 – USB Port Power Controller with Charger Emulation, 20LD QFN | Microchip Technology Inc. | **UCS1001-3-BP** |

**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-2:     BILL OF MATERIALS – PARTS ADDED TO THE PACKAGE**

| Qty. | Designator | Description | Manufacturer | Part Number |
|---|---|---|---|---|
| 4 | B1, B2, B3, B4 | Bumpon cylindrical .312 x .210 blk. | 3M | SJ61A11 |
| 1 | 5V transformer | Adapter wall R-series 20W 5V | Phihong USA Inc. | PSAA20R-050 |
| 1 | AC plug | Adapter wall R-series clip US | Phihong USA Inc. | RPA |

**NOTES:**

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