EVB-USB7002 Evaluation Kit 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 EVB-USB7002 Evaluation Kit. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the EVB-USB7002 Evaluation Kit as a demonstration platform optimized for portable applications. The manual layout is as follows:

- **Chapter 1. "Overview"** – Shows a brief description of the EVB-USB7002 Evaluation Kit.
- **Chapter 2. "Getting Started"** – Provides information about setup and operation of the EVB-USB7002 Evaluation Kit.
- **Chapter 3. "Hardware Configuration"** – Includes information about the hardware configuration of the EVB-USB7002 Evaluation Kit.
- **Appendix A. "Schematics"** – This appendix shows the EVB-USB7002 Evaluation Kit schematics.
- **Appendix B. "Bill of Materials (BOM)"** – This appendix includes the EVB-USB7002 Evaluation Kit Bill of Materials (BOM).
- **Appendix C. "PCB Silk Screens"** – This appendix includes the EVB-USB7002 Evaluation Kit silk screen.

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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) { ... }`

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- **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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- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART Plus and PIC-kit 2 and 3.

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- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the web site at:
http://www.microchip.com/support

DOCUMENT REVISION HISTORY

TABLE 3-1:

Revisions	Section/Figure/Entry	Correction
DS50002800A (09-12-18)	Initial release	

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Chapter 1. Overview

1.1 INTRODUCTION

The EVB-USB7002 is a demonstration and evaluation platform that provides the necessary requirements and interface options for evaluating the USB7002, which is a 4-port High-Speed (HS) USB smart hub on a 4-layer RoHS-compliant Printed Circuit Board (PCB). This allows the user to gain an understanding of the product and accelerate the integration of the USB7002 into the user's design.

The EVB-USB7002 is compliant with the USB 2.0 HS, Full-Speed (FS), and Low-Speed (LS) USB signaling. The EVB-USB7002 is also compliant with USB 3.1 Gen1 on the upstream port and on downstream ports 1 and 2.

The evaluation platform supports four downstream ports: two Gen1 ports with Type-C connectors and two USB2.0 ports with Type-A connectors. The EVB-USB7002 platform also supports battery charging on all four downstream ports (maximum of 10A(Note 1) at any one time). The EVB-USB7002 supports FlexConnect role reversal for any of the four downstream ports with the upstream port.

The EVB-USB7002 has four configurations for operation through internal default settings and supports custom configurations through SMBus or through the external 16-Mbit SPI Flash device.

The EVB-USB7002 demonstrates driver compatibility with Microsoft® Windows® 10, Windows 8.x, Windows 7, Windows XP, Mac OS® X 10.4+, and Linux® hub drivers.

For more information about EVB-USB7002, see **Section 1.2 "Features"**.

Note 1: Requires a 12V, 85W supply.

1.2 FEATURES

- Microchip's PortSwap, PHYBoost™, and VariSense™ technologies
- USB7002 in a 100-pin QFN RoHS compliant package
- USB 3.1 compliant (Gen1 operation)
- USB 2.0 compliant (HS, FS, and LS operation)
- 5V-tolerant USB pins
- Self-powered operation
- USB Gen1 Type-C upstream port
- Four Downstream USB ports:
  - Two Type-C Gen1 downstream ports
  - Two Type-A USB 2.0-only downstream ports
- All downstream ports support individual port power and overcurrent sense.
- All downstream ports can be enabled for battery charging with the battery charging select shunts J1 and J20. (BC1.2 or SE1, 2.1A max per port)
- Onboard SPI Flash for external downloadable firmware
- Operates from a single voltage (+12.0V, regulated) external power supply
- Onboard 25 MHz crystal or oscillator input
- Single onboard +5.2V, 15A regulator

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- Single onboard +3.3V, 0.5A regulator
- Single onboard +1.2V, 2A regulator
- Port Power LED indicators
- SPI Flash activity blue LED indicator
- Reset red LED indicator
- Green LED indicators for 5V, 3.3V, and 1.2V regulator outputs
- Terminal block connector for use with an external 12 VDC bench supply
- Barrel connector for use with a Microchip 12V power supply
- Removable or non-removable downstream ports options can be configured with select shunt on J17.
- Bridge peripheral functions:
  - USB-to-UART (CDC)
  - USB-to-I^2S Audio Codec
  - USB-to-SMBus
  - USB-to-I^2C

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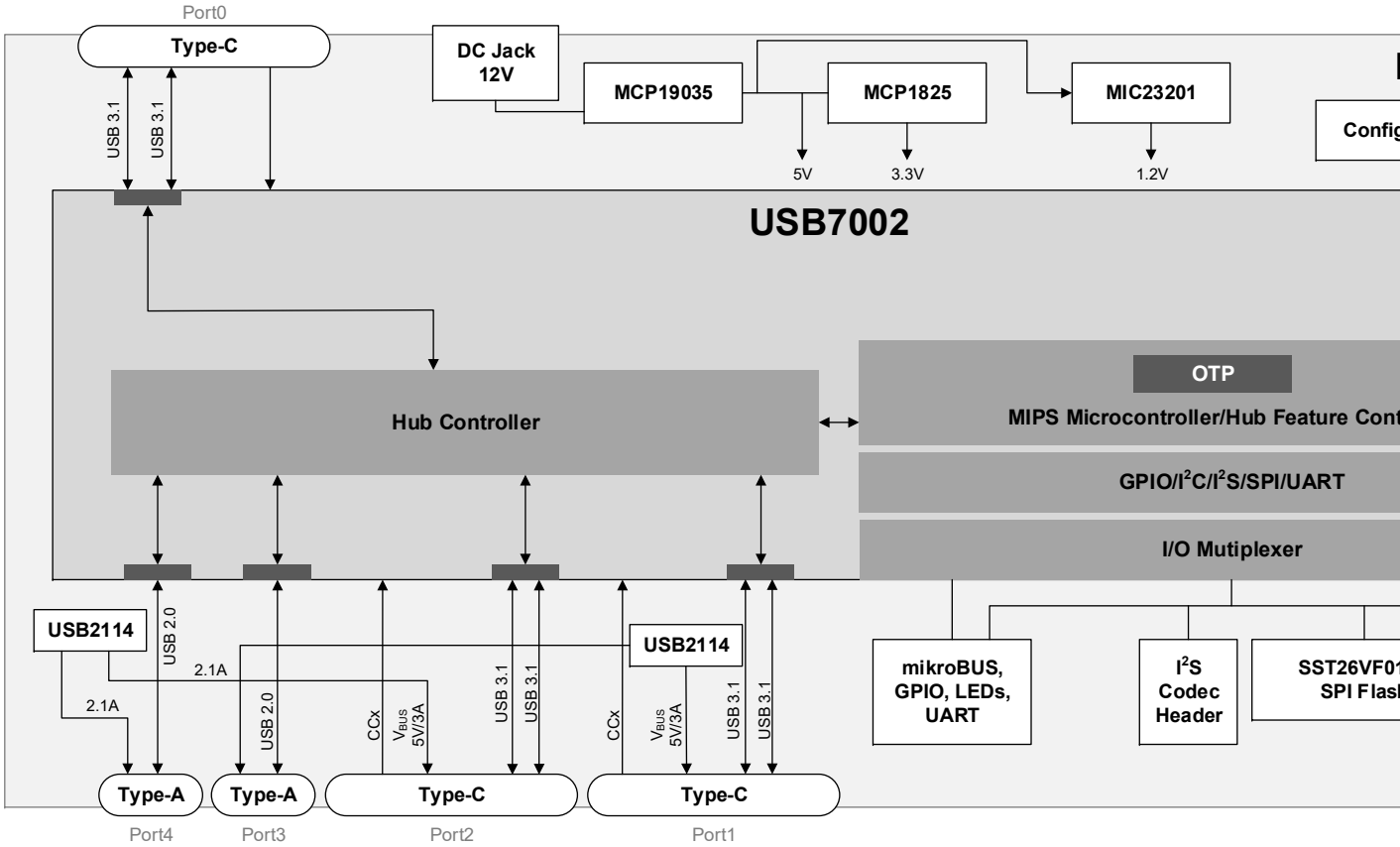
1.3 BLOCK DIAGRAM

FIGURE 1-1: EVB-USB7002 BLOCK DIAGRAM



1.4 REFERENCES

Concepts and materials available in the following documents may be helpful when reading this document. Visit www.microchip.com for the latest documentation.

- *USB7002 Data Sheet*

1.5 ACRONYMS AND DEFINITIONS

TABLE 1-1: ACRONYMS AND DEFINITIONS

Acronym	Definition
BC1.2	Latest USB-IF specified USB battery charging standard
CDP	Charging Downstream Port, a BC1.2-compliant port allows simultaneous USB data and USB charging
DCP	Dedicated Charging Port, a BC1.2-compliant port which is only capable of USB charging (no data)
DFP	Downstream Facing Port
EVB	Evaluation Board
OTP	One-Time-Programmable Memory
SDP	Standard Downstream Port, a standard USB port with no high-current battery charging capabilities
SE1	Type of Battery Charging (non-USB compliant) that sets the USB D+/D- to specific DC voltages to communicate charging capability
Type-C	Reversible USB Connector
USB-IF	USB Integrators Forum, a collection of corporate sponsored members responsible for developing USB specifications
Gen1	USB Specification 3.1 Gen1

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Chapter 2. Getting Started

2.1 INTRODUCTION

The Microchip EVB-USB7002 is designed for flexible configuration solutions. It can be configured via default internal register settings, via a downloadable external firmware to an onboard SPI Flash (OTP memory), via SMBus, or via the onboard configuration switches. When configured with the default internal register settings, the device operates as a USB 3.1 Gen1 hub with one upstream Gen1 port, two downstream Gen2 ports, and two downstream USB 2.0 ports, with Microchip's standard VID/PID/DID settings.

Microchip provides a comprehensive software programming tool, MPLAB® Connect (MPLABC), for configuring USB7002 functions, registers, and OTP memory. USB7002 requires MPLABC version 2.1.0 or greater.

For additional information on the MPLABCC programming tool, refer to Software Libraries within the Microchip USB7002 product page at www.microchip.com/USB7002.

2.2 KIT CONTENTS

The EVB-USB7002 Evaluation Kit includes the basic equipment necessary for evaluation. The items included in the kit are:

- EVB-USB7002 Evaluation Board
- 12V Power Supply
- Type-A to Type-C USB cable

2.3 QUICK START

To quickly start using the board, perform the following steps:

1. Connect the included 12V power supply to the barrel connector on the EVB-USB7002 (J1).
2. Using a Type-A to Type-C USB cable, connect the EVB-USB7002 to a USB host via the upstream "Port 0" USB Type-C socket (J3).

Devices may now be connected to any of the downstream ports to enumerate and use those devices with the USB host.

To perform additional configuration or evaluate specific features, launch the MPLABC software on your USB host or manipulate the included hardware configuration options detailed in the next sections.

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NOTES:

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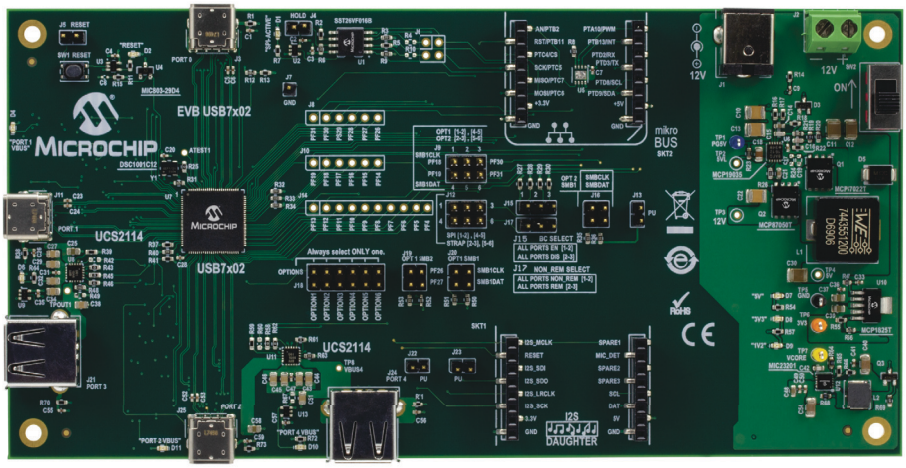
Chapter 3. Hardware Configuration

3.1 HARDWARE CONFIGURATION OPTIONS

Figure 3-1 shows the top view of the EVB-USB7002.

FIGURE 3-1: EVB-USB7002 REV B (TOP VIEW)



3.1.1 Configuration

3.1.1.1 EXTERNAL SPI FLASH

Upon power-up, the USB7002 first looks for an external SPI ROM device and a valid signature in the Flash. If one is found, the external ROM is enabled and code execution is initiated from the external SPI ROM device.

To enable operation from the SPI device, install shunts to pins 1-2 and 4-5 of J12. When code is executing from an SPI ROM device, a blue LED "SPI-ACTIVE" (D1) illuminates.

Note 1:	CFG_BC and CFG_Non-Rem options are deselected when SPI shunts are installed on J17. When operating in SPI mode, all configuration is handled by the code executing from the SPI ROM device.
2:	If the SPI Flash is not properly programmed or has an invalid signature, the USB7002 reverts to internal defaults even if the SPI ROM is selected.

3.1.1.2 SMBUS2

If an SPI Flash device is not found, the firmware checks if SMBus2 is enabled.

To select SMBus2 configuration, leave J17 open to disconnect the SPI ROM. To select OPTION1 from the CFG_STRAP header, shunt pins 1-2 of J18. To connect the SMBus2 pull-up resistors, connect a shunt to J22 pins 1-2. The SMBus2 signals may be accessed at J19, where pin 1 is the clock and pin 3 is data (pin 2 is ground).

If configuration OPTION1 is selected and SMBus2 is enabled (that is, SMBus2 clock and data are pulled up), the USB7002 waits indefinitely for data from the SMBus2 interface and will not enumerate to the USB host until the special USB Attach command is sent.

See the Configuration Options for USB70xx application note for additional details.

3.1.1.3 INTERNAL DEFAULT CONFIGURATIONS WITH STRAPPING OPTIONS

When the USB7002 does not detect a valid SPI Flash image and does not look for SMBus2 configuration upon power-up, the USB7002 uses internal default register settings. It also sets the Vendor ID, Product ID, Language ID, and Device ID, and additional settings from the internal ROM code.

If configuration is not done through SPI or SMBus2, additional configuration is available through two functions: CFG_BC_EN and CFG_NON-REM. The controls are configured by selecting one of the six resistor values for each pin. The EVB-USB7002 demonstrates two of the six possible resistor values for each of CFG_BC_EN and CFG_NON-REM. These straps are sensed by the USB7002 device at power-on to determine the resultant configuration of the device.

To select the CFG_BC_EN and CFG_NON-REM modes, shunts must be connected to J12, J15, and J17 headers.

To use the battery charging strap options, connect a shunt to pins 2-3 of J12 and connect a shunt to J15 according to Table 3-1. For the NON_REM strap options, connect a shunt to pins 5-6 of J12 and connect a shunt to J17 according to Table 3-2.

TABLE 3-1: BATTERY CHARGING OPTIONS (CFG_BC_EN - J15)

J15 Shunt Position	(J12 is shunted pins 2-3.)
2-3	All ports are BC 1.2-disabled.
1-2	All downstream ports are BC1.2-enabled.

TABLE 3-2: NON-REMOVABLE PORT OPTIONS (CFG_NON-REM - J17)

J17 Shunt Position	(J12 is shunted pins 5-6.)
1-2	All ports are non-removable.
2-3	All ports are removable.

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3.1.2 Power Source - Self Powered

The EVB-USB7002 only supports self-powered operation. Power is supplied through one +12.0V regulated external power supply. The power supply is connected to the 2.5 mm connector J1 on the board. Alternatively, an external voltage can be supplied to the screw terminal “12V” (J2). The +12.0V feeds a 15A regulator that outputs +5.2V (nominal) across the board and also supplies the +3.3V regulator and the 1.2V regulator.

CAUTION

The supplied 12.0V external power supply cannot support simultaneous battery charging on all downstream ports. Use a higher power supply if the required test use case exceeds the power capability of the supply. Failure to heed to this warning could result in damage to the 12.0V external power supply.

3.1.3 Downstream Port Power Control

USB power to the four downstream ports is controlled via port power controllers with auto-discharge functionality. All downstream ports support BC 1.2 battery charging.

The two downstream USB Type-C ports are each capable of up to 3A of current at 5V. The two downstream USB Type-A ports are capable of up to 2.1A at 5V.

3.1.4 USB Type-C Ports

The USB7002 has two USB3.1 Gen 1 PHYs for each Type-C port. This eliminates the need for an external multiplexer. The USB7002 also features integrated Type-C control signal (CC) detection to determine when and in what orientation a USB Type-C attach has been made. It powers only the USB3.1 Gen 1 PHY needed for USB communication. To reduce power, the USB7002 powers down unused USB3.1 Gen 1 PHYs. In the case where no USB Type-C attach is detected, both USB3.1 Gen 1 PHYs associated with that port are powered down.

3.1.5 LED Indicators

Table 3-3 describes the LED indicators on the EVB-USB7002.

TABLE 3-3: EVB-USB7002 LED INDICATOR DESCRIPTIONS

Ref. Des.	Label	Description
D1	“SPI-ACTIVE”	Indicates SPI Flash Memory activity.
D2	“RESET”	The RST_N signal is asserted.
D4	“PORT 1 VBUS”	Illuminates when 5V to upstream PORT1 VBUS is present.
D6	“PORT 3 VBUS”	Illuminates when 5V to upstream PORT3 VBUS is present.
D7	“5V”	Illuminates when 5V is present from the 5V voltage regulator.
D8	“3V3”	Illuminates when 3.3V is present from the 3.3V voltage regulator.
D9	“VCORE”	Illuminates when 1.2V (VCORE) is present from the 1.2V regulator.
D10	“PORT 4 VBUS”	Illuminates when 5V to upstream PORT4 VBUS is present.
D11	“PORT 2 VBUS”	Illuminates when 5V to upstream PORT2 VBUS is present.
D14	“ATTACH2”	Illuminates when a device is detected by CC signals on PORT2.

3.1.6 Switches

Table 3-4 describes the switches on the EVB-USB7002.

TABLE 3-4: EVB-USB7002 SWITCH DESCRIPTIONS

Ref. Des.	Label	Description
SW1	"RESET"	Momentary push-button switch to assert RST_N.
SW2	"ON/OFF"	Connects or disconnects the 12 VDC supply.

3.1.7 Connector Descriptions

Table 3-5 describes the connectors included on the PCB.

TABLE 3-5: EVB-USB7002 CONNECTOR DESCRIPTIONS

Ref. Des.	Type	Label	Description
J1	Barrel Jack	"12VDC"	12 VDC supply connection (center pin positive)
J2	2-pin terminal block	—	Alternative 12 VDC supply connection. Pin 1 is positive.
J3	USB Type-C Connector	"PORT0"	Upstream Type-C connection
J4	1x2 Header	"HOLD"	When shunted, disables the SPI memory.
J1	2x3 Header	"SPI_DI/CFG_BC_EN" "SPI_CEn/CFG_NON_REM"	Selects between SPI memory capability and BC/NON_REM capability. For SPI, connect pins 2-3 and 5-6. For BC, connect pins 4-5. For NON_REM, connect pins 1-2.
J5	2x1 Header	"Ext.Reset"	Connection for an external reset switch
J6	2x2 Header	PF24 PF23 PF25 PF21	SPI data pins provided for debugging SPI memory
J7	1x1 Header	"GND"	Circuit Ground
J8	1x6 Header	—	PF26 - PF31
J9	2x3 Header	"SMBus1"	OPTION1: 1-2 and 4-5 connects SMBus1 OPTION2: 2-3 and 5-6 connects SMBus1
J10	1x6 Header	—	PF14 - PF19
J11	USB Type-C Connector	"PORT1"	Downstream Type-C Gen1 Port 1 USB connection
J12	2x3 Header	"SPI/BC/NR"	SPI_DI or CFG_BC_EN SPI_CEn or CFG_NON_REM See Table 3-1 and Table 3-2.
J13	1x2 Header	"PU"	Pull-up resistors, OPTION2 SMBus2
J14	1x10 Header	—	PF4 - PF13
J15	1x3 Header	"BC SELECT"	See Table 3-1.
J16	2x2 Header	"OPTION2 SMB1"	Access to SMBus1 in OPTION2
J17	1x3 Header	"NON_REM_SELECT"	See Table 3-2.

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TABLE 3-5: EVB-USB7002 CONNECTOR DESCRIPTIONS (CONTINUED)

Ref. Des.	Type	Label	Description
J18	2x6 Header	“CFG_SELECT”	Configuration Option select. Always select 1 and only 1 option.
J19	2x2 Header	“OPTION1 SMB2”	Access to SMBus2 in OPTION1
J20	2x2 Header	“OPTION1 SMB1”	Access to SMBus1 in OPTION1
J21	USB2 Type-A Connector	“PORT3”	Downstream Port 3 USB connection
J22	1x2 Header	“PU”	Pull-up resistors, OPTION1 SMBus2
J23	1x2 Header	“PU”	Pull-up resistors, OPTION1 SMBus1
J24	USB2 Type-A Connector	“PORT4”	Downstream Port 4 USB connection
J25	USB Type-C Connector	“PORT2”	Downstream Port 2 USB connection
J26	1x3 Header	—	Spares for future use

3.1.8 Test Points

Table 3-6 describes the test points on the EVB-USB7002. A header may be permanently installed on the through-hole test points if needed.

TABLE 3-6: EVB-USB7002 TEST POINT DESCRIPTIONS

Ref. Des.	Type	Description
TPOUT1	Test Pad	PORT3 VBUS
TP1	Test Loop (Blue)	Signal PG5V
TP2	Test Loop (Red)	Signal 5VL
TP3	Test Loop (Red)	12V
TP4	Test Loop (Red)	5V
TP5	Test Loop (Black)	Circuit Ground
TP6	Test Loop (Orange)	3.3V
TP7	Test Loop (Orange)	VCORE (1.2V)
TP8	Test Pad	PORT4 VBUS

NOTES:

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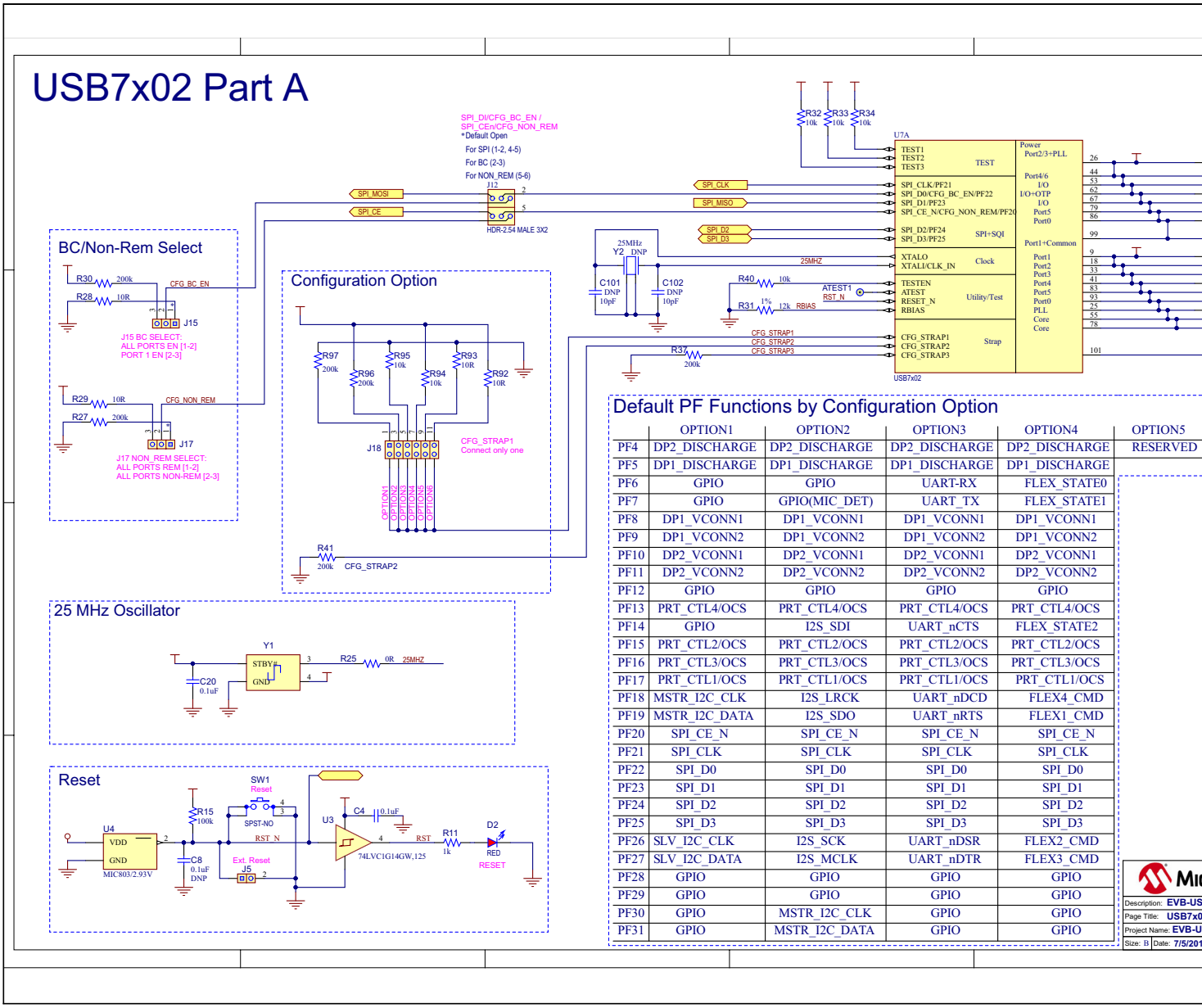
Appendix A. Schematics

A.1 INTRODUCTION

This appendix shows the EVB-USB7002 Evaluation Kit schematic.

FIGURE A-1: EVB-USB7002 USB7X02 PART A



	OPTION1	OPTION2	OPTION3	OPTION4	OPTION5
PF4	DP2_DISCHARGE	DP2_DISCHARGE	DP2_DISCHARGE	DP2_DISCHARGE	RESERVED
PF5	DP1_DISCHARGE	DP1_DISCHARGE	DP1_DISCHARGE	DP1_DISCHARGE	
PF6	GPIO	GPIO	UART-RX	FLEX_STATE0	
PF7	GPIO	GPIO(MIC_DET)	UART_TX	FLEX_STATE1	
PF8	DP1_VCONN1	DP1_VCONN1	DP1_VCONN1	DP1_VCONN1	
PF9	DP1_VCONN2	DP1_VCONN2	DP1_VCONN2	DP1_VCONN2	
PF10	DP2_VCONN1	DP2_VCONN1	DP2_VCONN1	DP2_VCONN1	
PF11	DP2_VCONN2	DP2_VCONN2	DP2_VCONN2	DP2_VCONN2	
PF12	GPIO	GPIO	GPIO	GPIO	
PF13	PRT_CTL4/OCS	PRT_CTL4/OCS	PRT_CTL4/OCS	PRT_CTL4/OCS	
PF14	GPIO	I2S_SDI	UART_nCTS	FLEX_STATE2	
PF15	PRT_CTL2/OCS	PRT_CTL2/OCS	PRT_CTL2/OCS	PRT_CTL2/OCS	
PF16	PRT_CTL3/OCS	PRT_CTL3/OCS	PRT_CTL3/OCS	PRT_CTL3/OCS	
PF17	PRT_CTL1/OCS	PRT_CTL1/OCS	PRT_CTL1/OCS	PRT_CTL1/OCS	
PF18	MSTR_I2C_CLK	I2S_LRCK	UART_nDCD	FLEX4_CMD	
PF19	MSTR_I2C_DATA	I2S_SDO	UART_nRTS	FLEX1_CMD	
PF20	SPI_CE_N	SPI_CE_N	SPI_CE_N	SPI_CE_N	
PF21	SPI_CLK	SPI_CLK	SPI_CLK	SPI_CLK	
PF22	SPI_D0	SPI_D0	SPI_D0	SPI_D0	
PF23	SPI_D1	SPI_D1	SPI_D1	SPI_D1	
PF24	SPI_D2	SPI_D2	SPI_D2	SPI_D2	
PF25	SPI_D3	SPI_D3	SPI_D3	SPI_D3	
PF26	SLV_I2C_CLK	I2S_SCK	UART_nDSR	FLEX2_CMD	
PF27	SLV_I2C_DATA	I2S_MCLK	UART_nDTR	FLEX3_CMD	
PF28	GPIO	GPIO	GPIO	GPIO	
PF29	GPIO	GPIO	GPIO	GPIO	
PF30	GPIO	MSTR_I2C_CLK	GPIO	GPIO	
PF31	GPIO	MSTR_I2C_DATA	GPIO	GPIO	

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FIGURE A-2: EVB-USB7002 USB7X02 PART B AND AUDIO CODEC INTERFACE

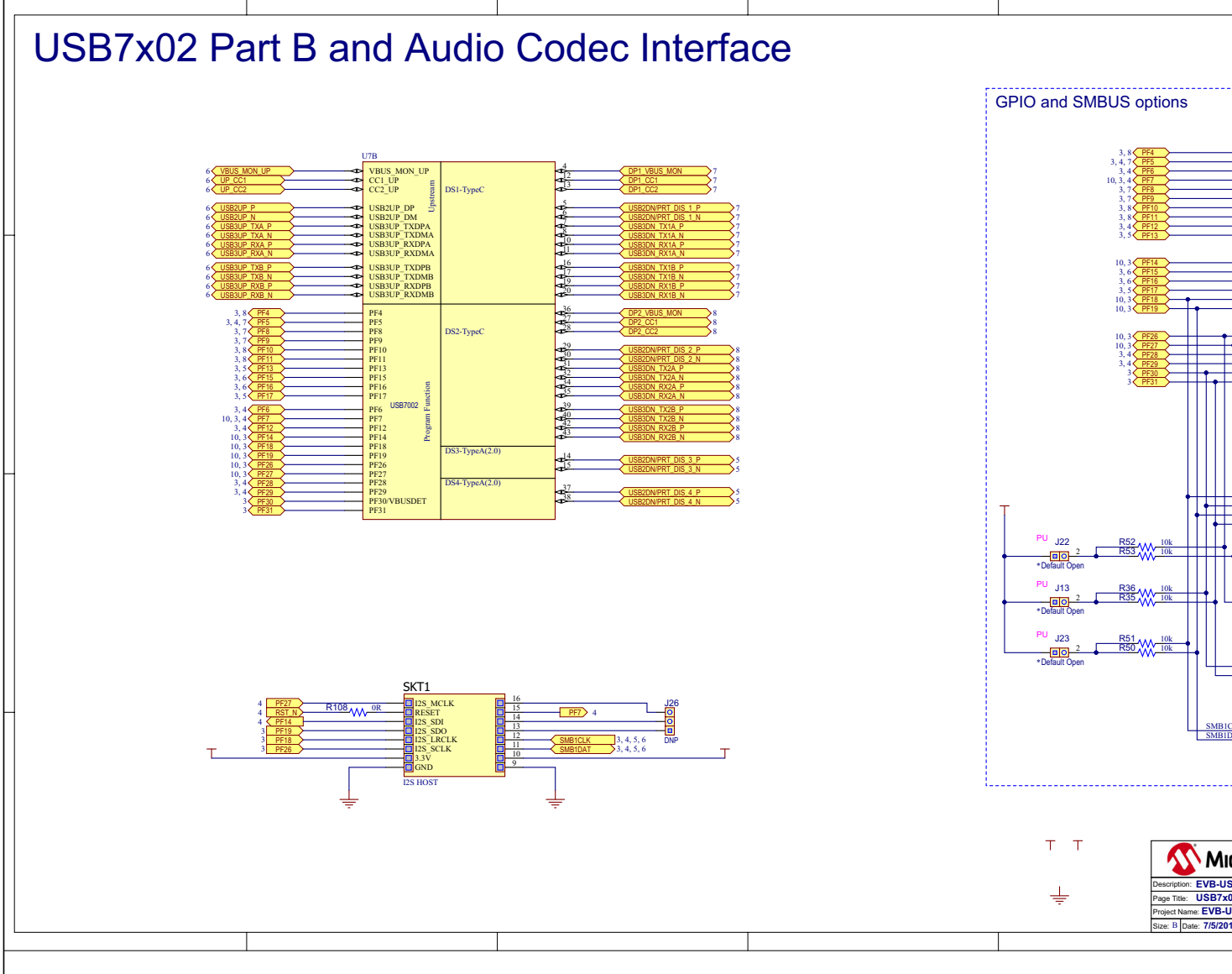

FIGURE A-3: EVB-USB7002 MEMORY AND MIKROBUS

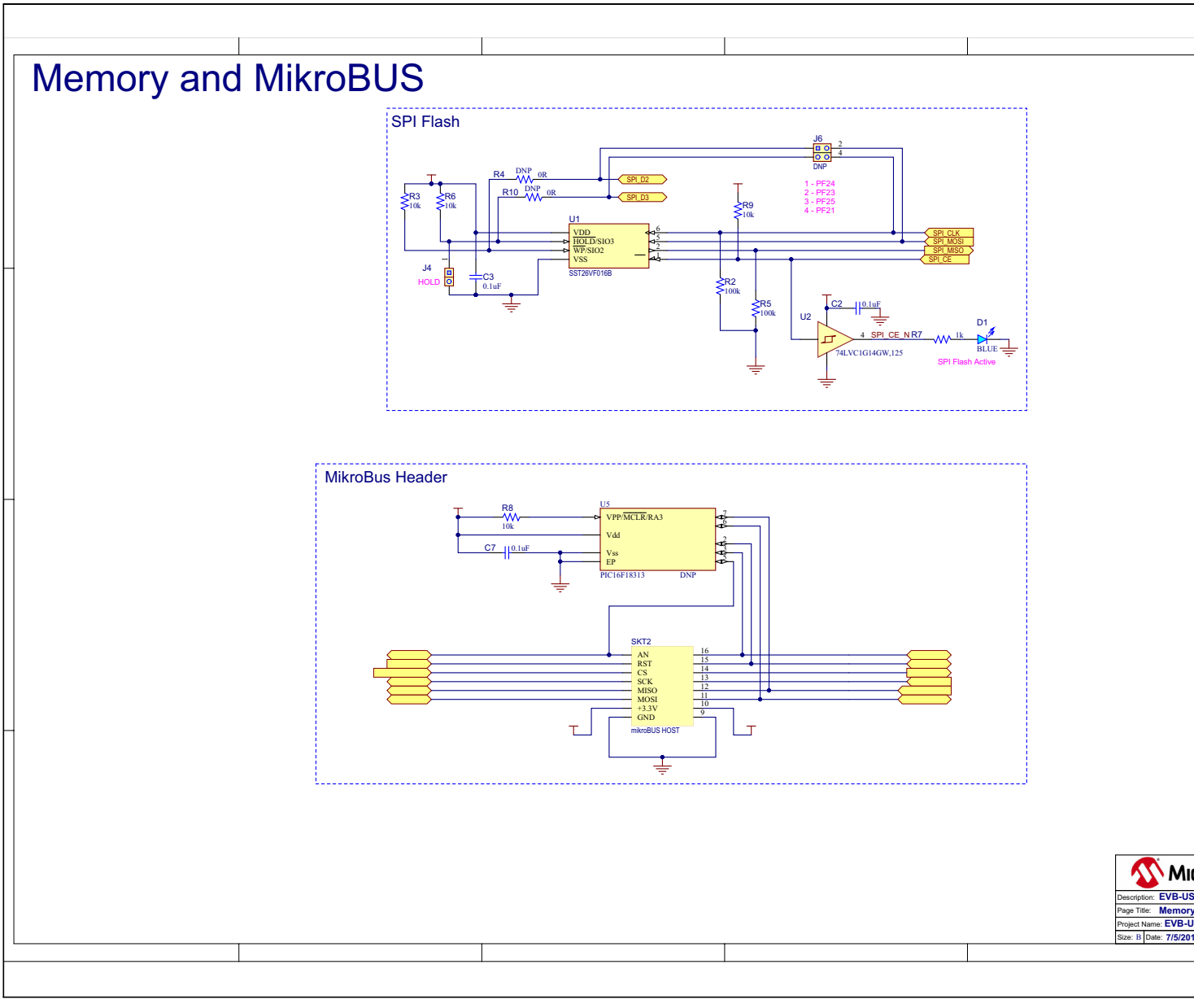

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FIGURE A-4: EVB-USB7002 USB A PORTS AND POWER SWITCH

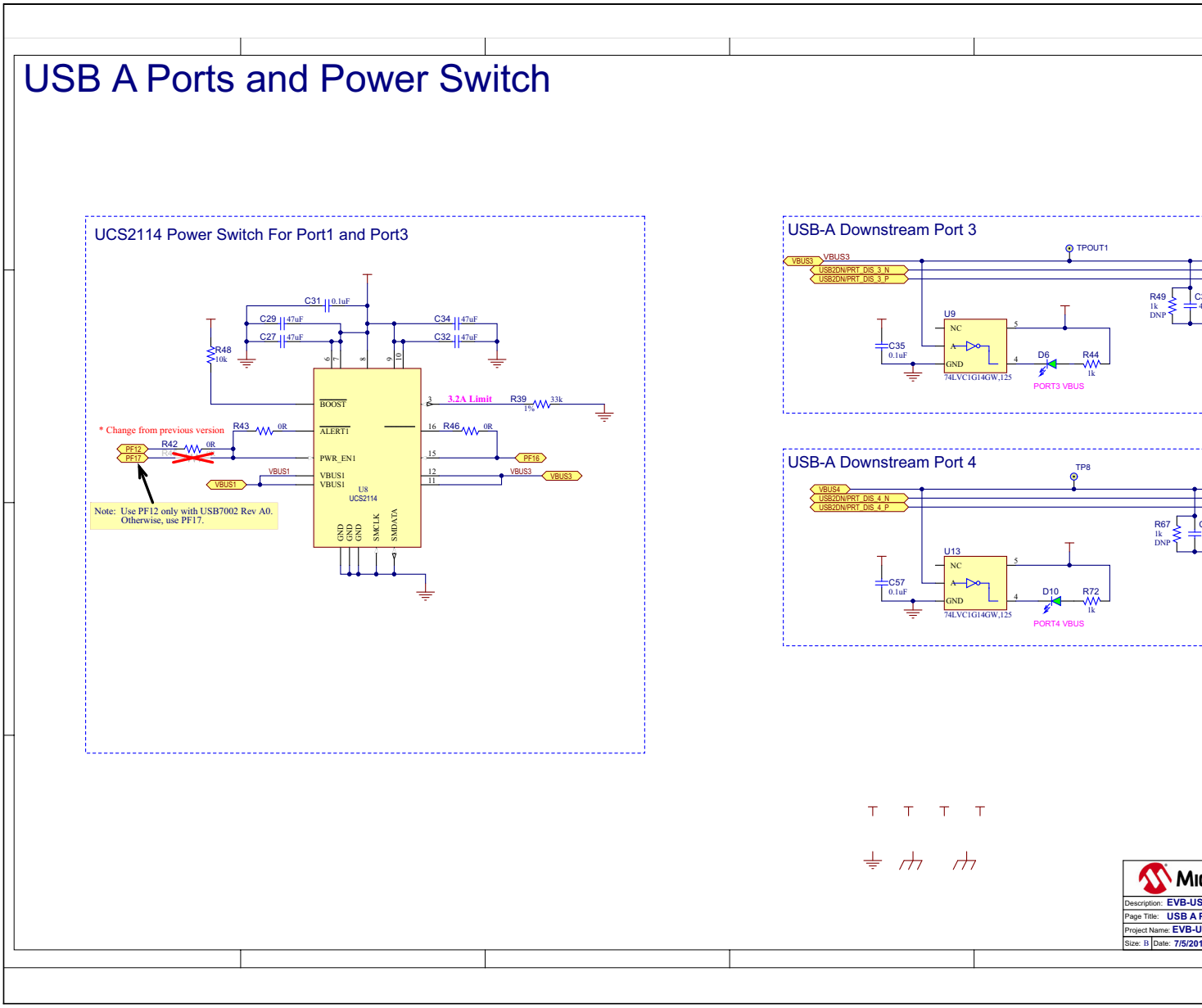

FIGURE A-5: EVB-USB7002 USB C UPSTREAM AND POWER SWITCH

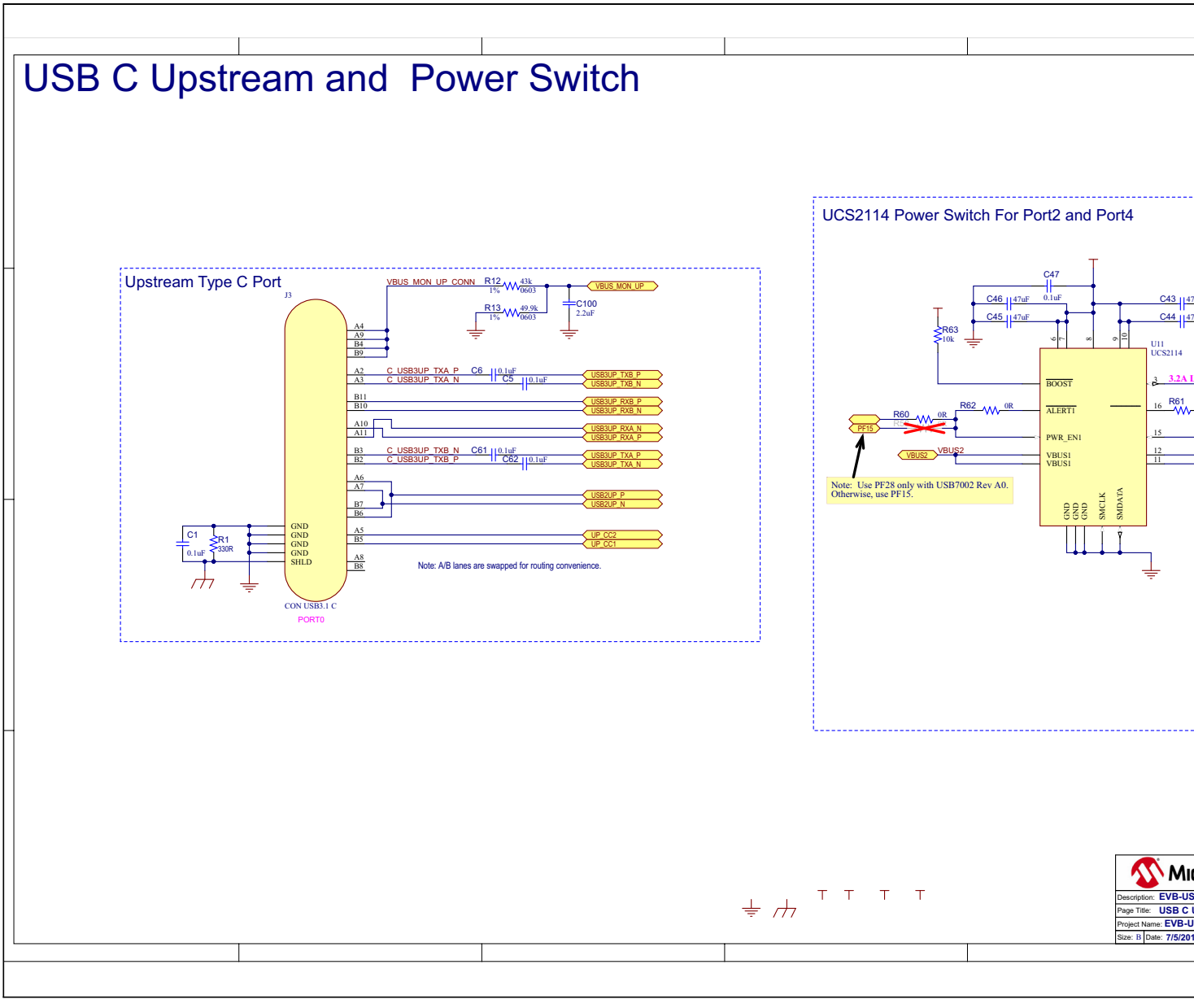

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FIGURE A-6: EVB-USB7002 USB C DOWNSTREAM 1

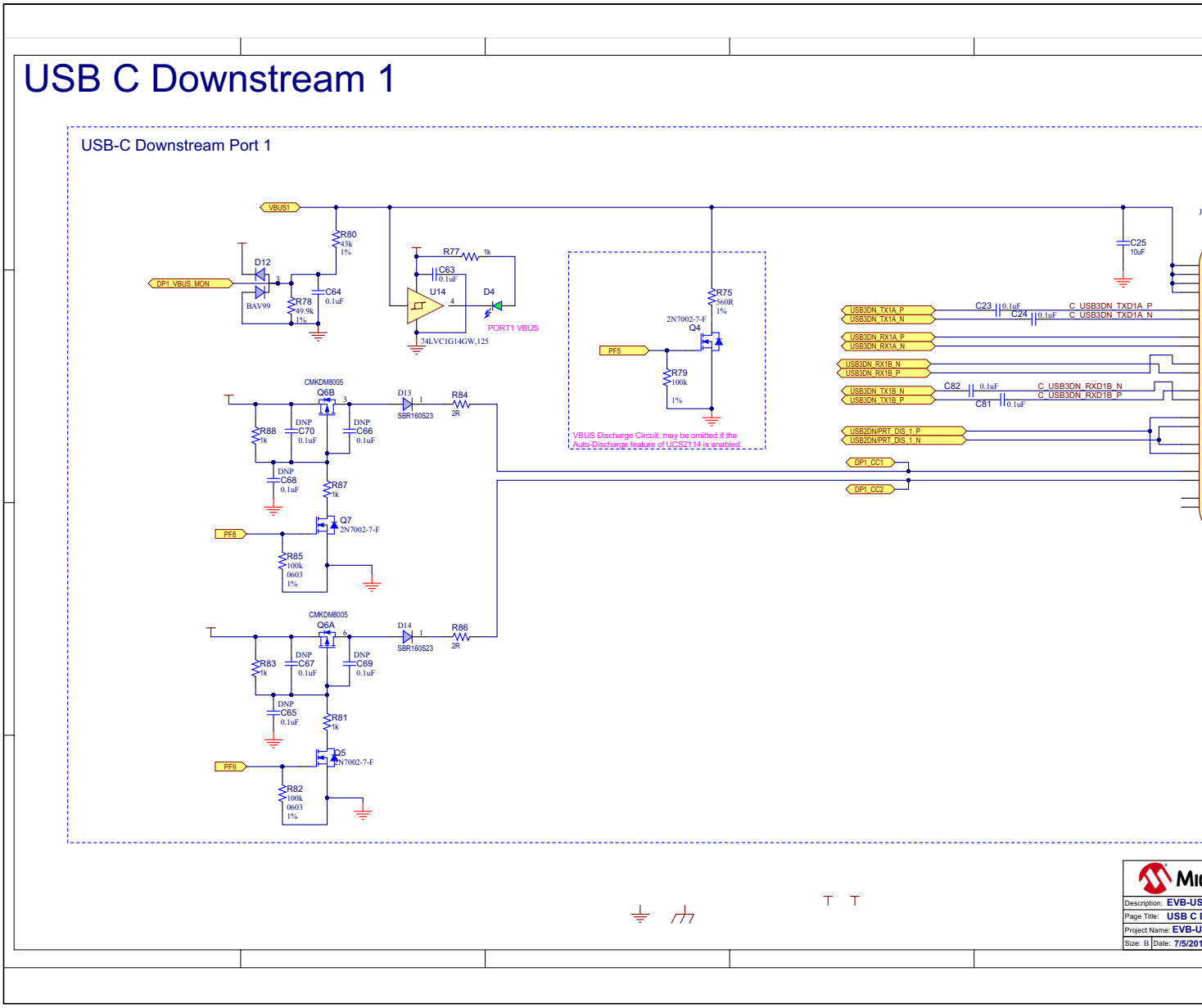

FIGURE A-7: EVB-USB7002 USB C DOWNSTREAM 2

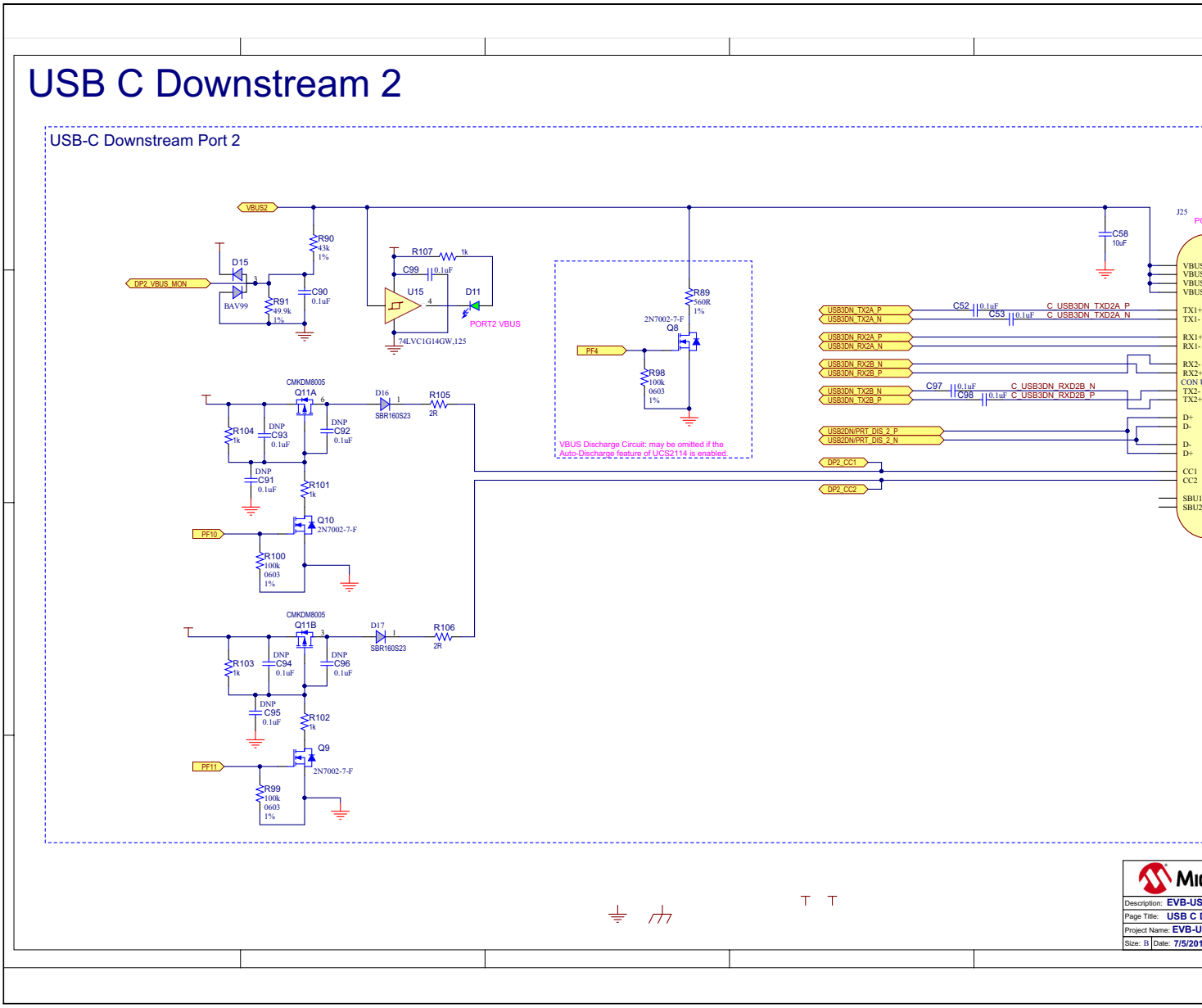

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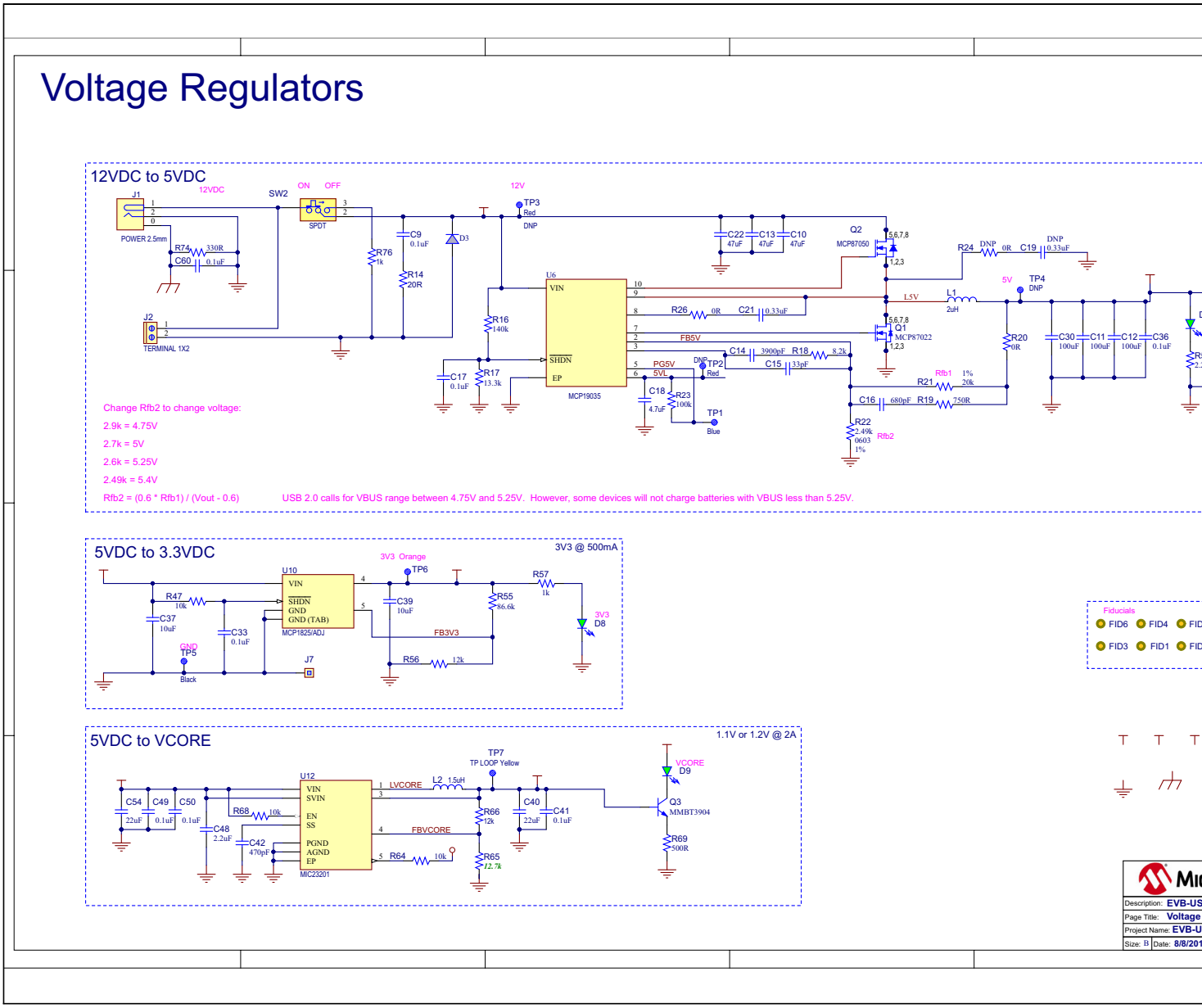
FIGURE A-8: EVB-USB7002 VOLTAGE REGULATORS



NOTES:

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Appendix B. Bill of Materials (BOM)

B.1 INTRODUCTION

This appendix contains the EVB-USB7002 Evaluation Board Bill of Materials (BOM).

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TABLE B-1: EVB-USB7002 BILL OF MATERIALS

Item	Quantity	Designator	Description	Populated	Manufacturer	
1	55	C1, C2, C3, C4, C5, C6, C7, C9, C17, C20, C23, C24, C26, C28, C31, C33, C35, C36, C41, C47, C49, C50, C52, C53, C55, C56, C57, C59, C60, C61, C62, C63, C64, C71, C72, C73, C74, C75, C76, C77, C78, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C97, C98, C99	CAP CER 0.1uF 16V 10% X7R SMD 0402	YES	Murata	
2	3	C10, C13, C22	CAP CER 47uF 16V 10% X5R SMD 1210	YES	Murata Electronics North America	
3	3	C11, C12, C30	CAP CER 100uF 10V 20% X5R SMD 1210	YES	Taiyo Yuden	
4	1	C14	CAP CER 3900pF 50V 5% C0G SMD 0603	YES	TDK	
5	1	C15	CAP CER 33pF 50V 5% NP0 SMD 0603	YES	Cal-Chip	
6	1	C16	CAP CER 680pF 50V 5% NP0 SMD 0603	YES	Panasonic	
7	1	C18	CAP CER 4.7uF 35V 10% X7R SMD 0805	YES	TDK Corporation	
8	1	C21	CAP CER 0.33uF 16V 10% X7R SMD 0603	YES	Murata	
9	5	C25, C37, C39, C58, C79	CAP CER 10uF 16V 10% X5R SMD 0805	YES	Wurth Electronics Inc	
10	10	C27, C29, C32, C34, C38, C43, C44, C45, C46, C51	CAP CER 47uF 6.3V 20% X5R SMD 0805	YES	Taiyo Yuden	
11	2	C40, C54	CAP CER 22uF 10V 10% X7R SMD 1206	YES	Samsung Electro-Mechanics America, Inc	
12	1	C42	CAP CER 470pF 25V 5% NP0 SMD 0603	YES	AVX	
13	1	C48	CAP CER 2.2uF 10V 10% X7R SMD 0603	YES	Murata	
14	1	C100	CAP CER 2.2UF 16V X5R 0402	YES	TDK	
15	1	D1	DIO LED BLUE 2.8V 20mA 15mcd Clear SMD 0603	YES	Lite-On	
16	1	D2	DIO RED 2V 20mA 54mcd CLEAR SMD 0603	YES	Lite-On Inc.	
17	1	D3	DIO RECT MMBD914-7-F 1.25V 200mA 75V SMD SOT-23-3	YES	Diodes Incorporated	
18	7	D4, D6, D7, D8, D9, D10, D11	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	YES	Lite-On Inc	
19	1	D5	DIO TVS SMBJP6KE6.8CA 5.8V 600W DO-214AA_SMB	YES	Micro Commercial Co	
20	2	D12, D15	DIO RECTARR BAV99 1.25V 200mA 70V SOT-23-3	YES	Fairchild	
21	4	D13, D14, D16, D17	DIO SBAR SBR160S23-7 SBR 530mV 900mA 60V SMD SOT23-3	YES	Diodes Incorporated	
22	1	J1	CON POWER 2.5mm 5.5mm TH R/A	YES	CUI Inc.	
23	1	J2	CON TERMINAL 5.08mm 1X2 Female 16-30AWG 13.5A TH RA	YES	TE Connectivity	
24	3	J3, J11, J25	CON USB3.0 TYPE-C FEMALE SMD R/A	YES	Advanced-Connectek Inc.	
25	5	J4, J5, J13, J22, J23	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	YES	FCI	

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TABLE B-1: EVB-USB7002 BILL OF MATERIALS (CONTINUED)

Item	Quantity	Designator	Description	Populated	Manufacturer	
26	1	J7	CON HDR-2.54 Male 1x1 Gold 5.84MH TH VERT	YES	TE Connectivity	5
27	2	J9, J12	CON HDR-2.54 Male 3x2 Gold 5.84MH TH VERT	YES	Samtec Inc.	T
28	2	J15, J17	CON HDR-2.54 Male 1x3 Gold 5.84MH TH VERT	YES	FCI	6
29	3	J16, J19, J20	CON HDR-2.54 Male 2x2 Gold 5.84MH TH VERT	YES	Samtec	T
30	1	J18	CON HDR-2.54 Male 2x6 Gold 5.84MH TH VERT	YES	Samtec	T
31	2	J21, J24	CON USB2.0 STD-A FEMALE TH R/A	YES	TE Connectivity AMP Connectors	2
32	1	L1	INDUCTOR 2uH 23A 20% SMD L12.8W12.8H6.2	YES	Wurth Electronics Inc.	7
33	1	L2	INDUCTOR 1.5uH 3A 20% SMD L5W5H2.2	YES	Murata Electronics North America	L
34	1	Q3	TRANS BJT NPN MMBT3904 40V 200mA 310mW SOT-23-3	YES	Diodes Incorporated	M
35	6	Q4, Q5, Q7, Q8, Q9, Q10	TRANS FET N-CH 2N7002-7-F 60V 170mA 370mW SOT-23-3	YES	Diodes Inc	2
36	2	Q6, Q11	TRANS FET DUAL P+P CMKDM8005 20V 650mA .360R 0.350W SOT-363	YES	Central Semiconductor Corp	C
37	6	R1, R38, R70, R71, R73, R74	RES TKF 330R 1% 1/10W SMD 0603	YES	Panasonic	E
38	9	R2, R5, R15, R79, R82, R85, R98, R99, R100	RES TKF 100k 1% 1/10W SMD 0603	YES	Panasonic	E
39	19	R3, R6, R8, R9, R32, R33, R34, R35, R36, R40, R47, R48, R50, R51, R52, R53, R63, R94, R95	RES TKF 10k 1% 1/10W SMD 0603	YES	ROHM	M
40	14	R7, R11, R44, R57, R72, R76, R77, R81, R83, R87, R88, R101, R104, R107	RES TKF 1k 1% 1/10W SMD 0603	YES	Panasonic	E
41	3	R12, R80, R90	RES TKF 43k 1% 1/10W SMD 0603	YES	Yageo	S
42	3	R13, R78, R91	RES TKF 49.9k 1% 1/10W SMD 0603	YES	Panasonic	E
43	1	R14	RES TKF 20R 1% 1/10W SMD 0603	YES	Panasonic	E
44	1	R16	RES TKF 140k 1% 1/10W SMD 0603	YES	Panasonic	E
45	1	R17	RES TKF 51k 1% 1/10W SMD 0603	YES	Panasonic	E
46	1	R18	RES TKF 8.2k 1% 1/10W SMD 0603	YES	Panasonic	E
47	1	R19	RES TKF 750R 1% 1/10W SMD 0603	YES	Vishay	C
48	2	R20, R26	RES TKF 0R 1/10W SMD 0603	YES	NIC Components	N
49	1	R21	RES TKF 20k 1% 1/10W SMD 0603	YES	Yageo	S
50	1	R22	RES TKF 2.49k 1% 1/10W SMD 0603	YES	Panasonic	E
51	1	R23	RES TF 100k 1% 1/8W SMD 0603	YES	Vishay	M
52	8	R25, R42, R43, R46, R60, R61, R62, R108	RES TKF 0R 1/10W SMD 0603	YES	Panasonic	E
53	6	R27, R30, R37, R41, R96, R97	RES TKF 200k 1% 1/10W SMD 0603	YES	Panasonic	E

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TABLE B-1: EVB-USB7002 BILL OF MATERIALS (CONTINUED)

Item	Quantity	Designator	Description	Populated	Manufacturer	
54	4	R28, R29, R92, R93	RES TKF 10R 1% 1/10W SMD 0603	YES	Panasonic	E
55	2	R31, R56	RES TKF 12k 1% 1/10W SMD 0603	YES	Yageo	F
56	2	R39, R59	RES TKF 33k 1% 1/10W SMD 0603	YES	Panasonic	E
57	1	R54	RES TKF 2.2k 1% 1/10W SMD 0603	YES	Panasonic	E
58	1	R55	RES TKF 86.6k 1% 1/10W SMD 0603	YES	Panasonic Electronic Components	E
59	2	R64, R68	RES TKF 10k 1% 1/10W SMD 0603	YES	Vishay	C
60	1	R65	RES TKF 13k 1% 1/10W SMD 0603	YES	Panasonic	E
61	1	R66	RES TKF 12.1k 1% 1/10W SMD 0603	YES	Panasonic	E
62	1	R69	RES TKF 500R 5% 1/10W SMD 0603	YES	Stackpole Electronics Inc	R
63	2	R75, R89	RES TKF 560R 1% 1/10W SMD 0603	YES	Yageo	F
64	4	R84, R86, R105, R106	RES TKF 2R 1% 1/4W SMD 0603	YES	Vishay Dale	C
65	2	R102, R103	RES TKF 1k 1% 1/16W SMD 0603	YES	MULTICOMP	M
66	2	SKT1	SOCKET I2S HOST DIP 16 TH	YES	3M	9
67	2	SKT2	SOCKET mikroBUS HOST DIP 16 TH	YES	3M	9
68	1	SW1	SWITCH TACT SPST 16V 50mA PTS810 SJM 250 SMTR LFS SMD	YES	C&K Components	P
69	1	SW2	SWITCH SLIDE SPDT 120V 6A 1101M2S3CQE2 TH	YES	C&K Components	1
70	1	TP1	CON TP LOOP BLUE Ag TH	YES	Keystone Electronics	5
71	1	TP5	MISC, TEST POINT MULTI PURPOSE MINI BLACK	YES	Keystone	5
72	1	TP6	CON TP LOOP Orange TH	YES	Keystone Electronics	5
73	1	TP7	MISC, TEST POINT PC MINI, 0.040" D YELLOW	YES	Keystone	5
74	6	U2, U3, U9, U13, U14, U15	74LVC1G14GW,125 SCHMITT-TRG INVERTER	YES	NXP	7
75	1	Q1	MCHP ANALOG MOSFET N-CH 25V 100A 0.0026R MCP87022T-U/MF PDFN-8	YES	Microchip Technology	M
76	1	Q2	MCHP ANALOG MOSFET N-CH 25V 100A 0.006R MCP87050-U/MF PDFN-8	YES	Microchip	M
77	1	U1	MCHP MEMORY SERIAL FLASH 16M 104MHz SST26VF016B-104I/SM SOIJ-8	YES	Microchip Technology	S
78	1	U4	MCHP ANALOG SUPERVISOR 2.93V MIC803-29D4VM3-TR SOT-23-3	YES	Microchip Technology	M
79	1	U6	MCHP ANALOG PWM CONTROLLER 600kHz MCP19035-BAABE/MF DFN-10	YES	Microchip	M
80	1	U7	MCHP INTERFACE USB 3.1 TYPE-C HUB CTLR TQFN-100	YES	Microchip Technology	U
81	2	U8, U11	MCHP INTERFACE USB Power Controller UCS2114 QFN-20	YES	Microchip	U
82	1	U10	MCHP ANALOG LDO ADJ MCP1825T-ADJE/DC SOT-223-5	YES	Microchip	M
83	1	U12	MCHP ANALOG SWITCHER Buck 0.95V to 3.6V 2A MIC23201YML-TR MLF-10	YES	Microchip Technology	M

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TABLE B-1: EVB-USB7002 BILL OF MATERIALS (CONTINUED)

Item	Quantity	Designator	Description	Populated	Manufacturer	
84	1	Y1	MCHP CLOCK OSCILLATOR SINGLE 25MHZ DSC1001-CI2-025.0000T CDFN-4	YES	Microchip Technology	D
85	13	C8, C65, C66, C67, C68, C69, C70, C91, C92, C93, C94, C95, C96	CAP CER 0.1uF 16V 10% X7R SMD 0402	DNP	Murata	G
86	1	C19	CAP CER 0.33uF 16V 10% X7R SMD 0603	DNP	Murata	G
87	2	C101, C102	CAP CER 10pF 50V 5% NP0 SMD 0402	DNP	Murata	G
88	1	J6	CON HDR-2.54 Male 2x2 Gold 5.84MH TH VERT	DNP	Samtec	T
89	2	J8, J10	CON HDR-2.54 Male 1x6 Tin 5.84MH TH VERT	DNP	Sullins	P
90	1	J14	CON HDR-2.54 Male 1x10 Gold 5.84MH TH VERT	DNP	Greenconn	G
91	1	J26	CON HDR-2.54 Male 1x3 Gold 5.84MH TH VERT	DNP	FCI	G
92	3	R4, R10, R24	RES TKF 0R 1/10W SMD 0603	DNP	Panasonic	E
93	2	R45, R58	RES TKF 0R 1/10W SMD 0603	DNP	Panasonic	E
94	2	R49, R67	RES TKF 1k 1% 1/10W SMD 0603	DNP	Panasonic	E
95	3	TP2, TP3, TP4	MISC, TEST POINT MULTI PURPOSE MINI RED	DNP	Keystone	5
96	1	U5	MCHP MCU 8-BIT 32MHz 3.5kB 256B PIC16F18313-I/RF UDFN-8	DNP	Microchip	P
97	1	Y2	Crystal 25MHz 4 pins 3225	DNP	Abracon	A

NOTES:

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Appendix C. PCB Silk Screens

C.1 INTRODUCTION

This appendix shows the top and bottom silk screen images of the EVB-USB7002 PCB.

FIGURE C-1: EVB-USB7002 TOP SILK SCREEN IMAGE

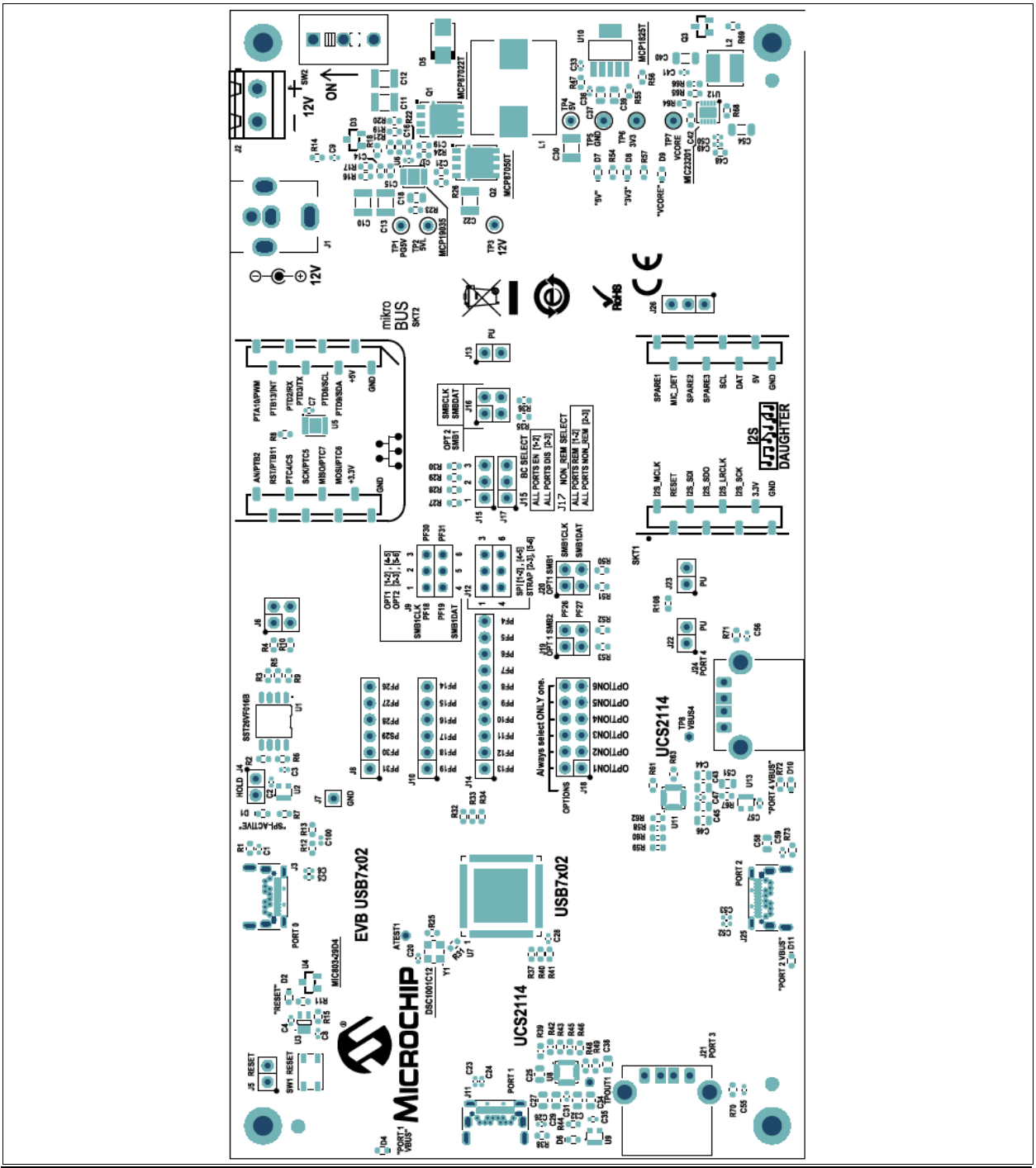
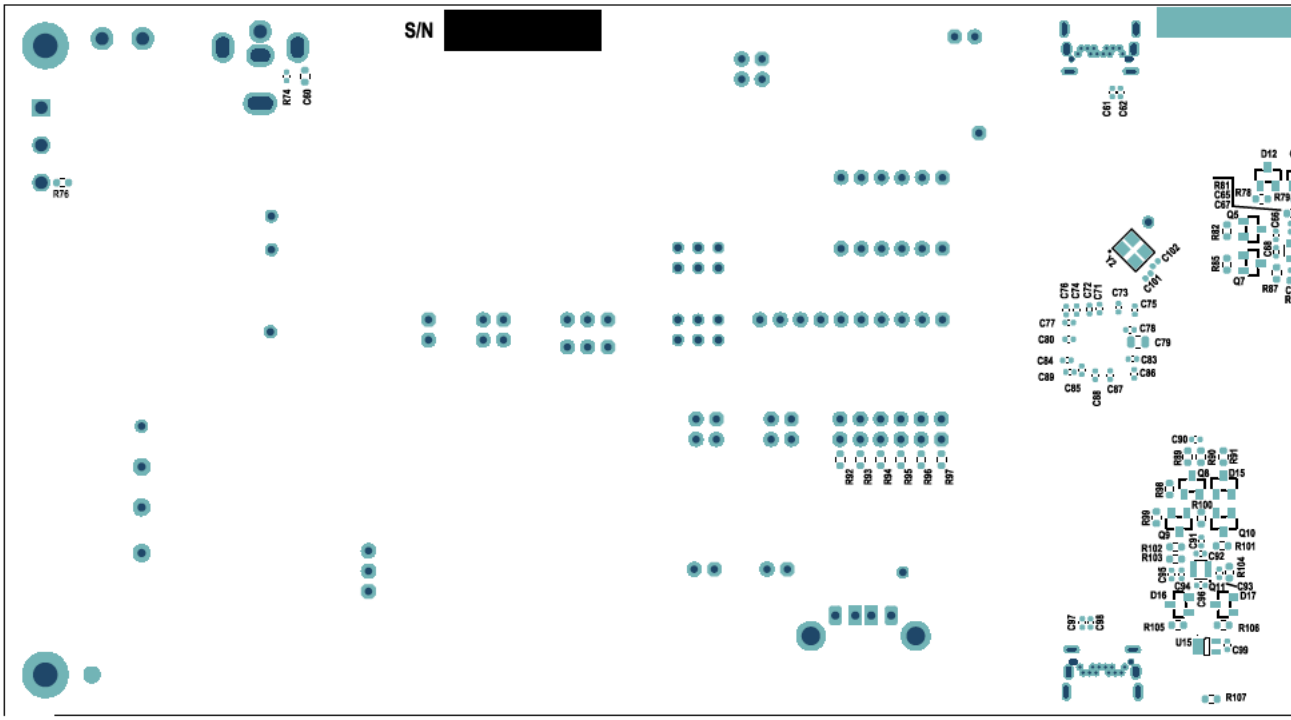


FIGURE C-2: EVB-USB7002 BOTTOM SILK SCREEN IMAGE



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China - Hangzhou
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China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

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India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

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Philippines - Manila
Tel: 63-2-634-9065

Singapore
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Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
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