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**EVB-USB5537
Evaluation Board
User's Guide**

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Object of Declaration: EVB-USB5537 Evaluation Board

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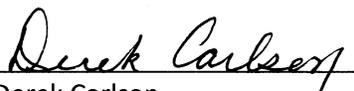
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Derek Carlson
VP Development Tools



Date

NOTES:

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NOTES:

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 “DSXXXXA”, where “XXXX” 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-USB5537 Evaluation Board. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [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-USB5537 Evaluation Board. The manual layout is as follows:

- **Chapter 1. “Overview”** – Shows a brief description of the EVB-USB5537 Evaluation Board.
- **Chapter 2. “Getting Started”** – Includes instructions on how to get started with the EVB-USB5537 Evaluation Board.
- **Appendix A. “EVB-USB5537 Evaluation Board”** – This appendix shows the EVB-USB5537 Evaluation Board.
- **Appendix B. “EVB-USB5537 Evaluation Board Schematics”** – This appendix shows the EVB-USB5537 Evaluation Board schematics.
- **Appendix C. “Bill of Materials (BOM)”** – This appendix includes the EVB-USB5537 Evaluation Board Bill of Materials (BOM).

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	<i>MPLAB® IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> 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	<u>File</u> > <i>Save</i>
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	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [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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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
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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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- 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 (May 2014)

- Initial release of this document.

Chapter 1. Overview

1.1 INTRODUCTION

The EVB-USB5537 revision E is a demonstration and evaluation platform that provides the necessary requirements and interface options for evaluating the USB5537B-60xx Ultra Fast seven port battery charging hub on a 4-layer RoHS-compliant Printed Circuit Board (PCB). This will allow the user to gain an understanding of the product and accelerate the integration of the USB5537B-60xx into the user's design. The USB5537B-60xx is compliant with the *USB 3.0 USB Specification* and supports Super-Speed (SS), High-Speed (HS), Full-Speed (FS), and Low-Speed (LS) USB signaling for complete coverage of all defined USB operation speeds. The evaluation platform supports four downstream USB 3.0 ports, three downstream USB 2.0 ports and also supports battery charging on all seven downstream ports (maximum of 5A at any one time). The USB5537B-60xx is configured for operation through internal default settings and supports custom configurations through SMBus or through the external 64-Mbit SPI Flash device, U11. The EVB-USB5537 demonstrates driver compatibility with Microsoft® Windows® 8x, Windows 7, Windows XP, Mac OS® X 10.4+, and Linux® hub drivers.

1.2 FEATURES

- USB5537B-60xx in a 72-pin QFN RoHS compliant package
- USB 3.0 compliant (SS, HS, FS, and LS operation)
- USB pins are 5 V tolerant
- Self-Powered operation
- Four downstream USB 2.0/3.0 ports
- Three additional downstream USB 2.0 ports
- All downstream ports support individual port power
- Downstream ports 1-4 support individual overcurrent sense
- Downstream ports 5-7 are configurable for individual overcurrent sense
- All downstream ports are battery charge enabled (2.5A max per port)
- Can support up to 5A downstream Port Power at any one time
- Supports Dynamic Battery Charge Enable/Disable
- Onboard SPI Flash for external downloadable firmware
- Low-Cost, 4-layer space saving design
- Operates from a single voltage (+12.0V, regulated) external power supply
- Onboard 25 MHz crystal by default
- Onboard +5.25 V, 6 Amp regulator
- Onboard +3.3 V, 0.5 Amp regulator
- Onboard +1.25 V, 1 Amp regulator
- +3.3 V, Port Power and Reset LED indicators
- Battery Charge Enable, Dynamic Battery Charge and Port Disable LED indicators
- Port Removable LED indicators
- Supports SMBus interface

FIGURE 1-1: TOP LEVEL SILK SCREEN AND COPPER LAYER

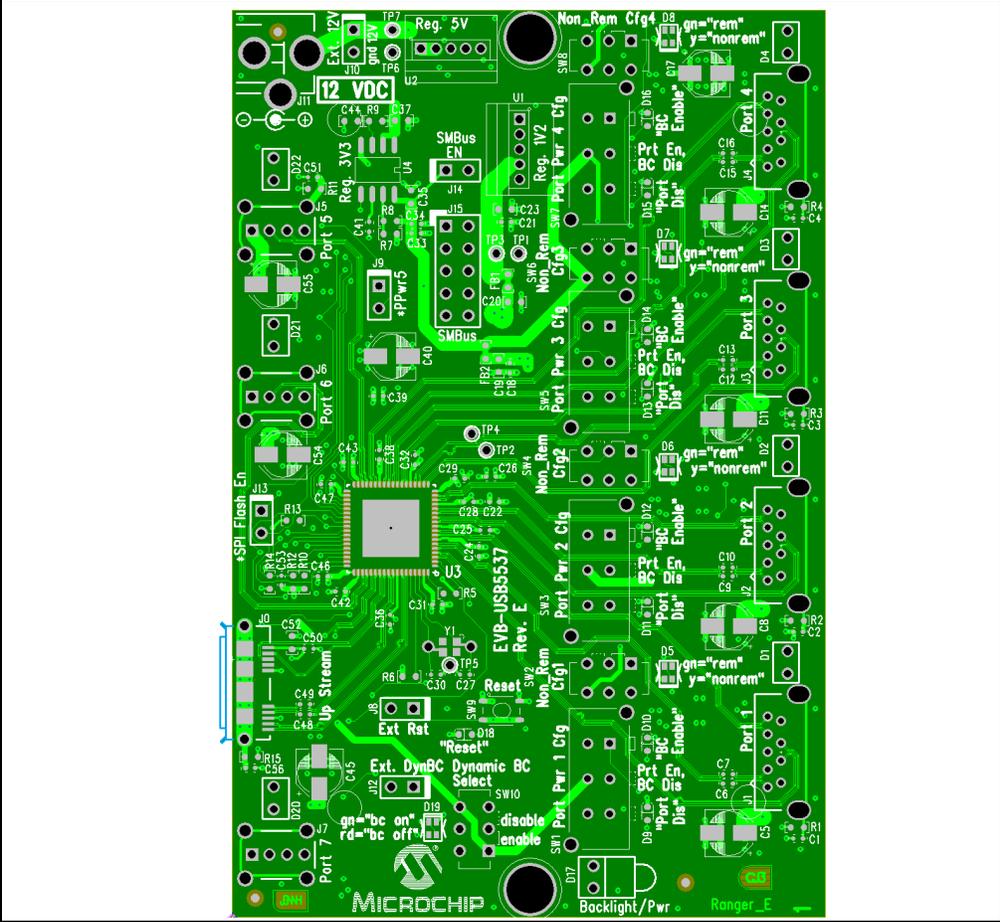
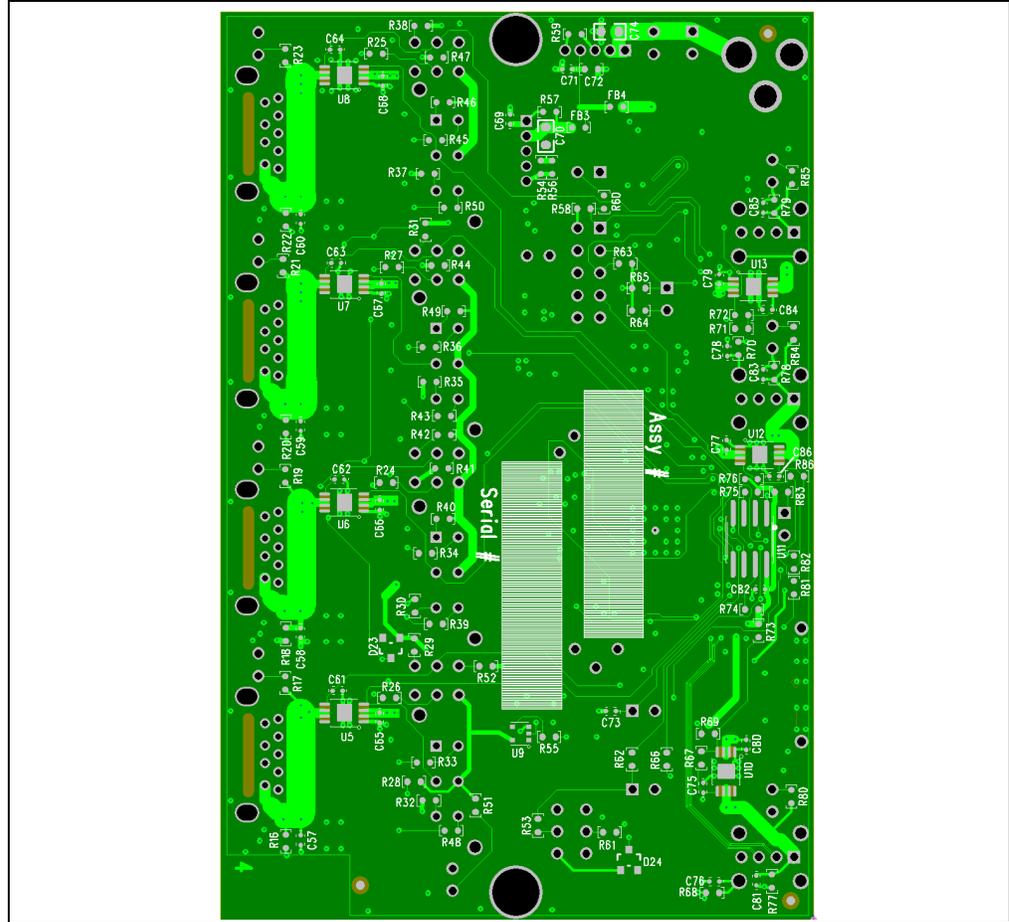


FIGURE 1-2: BOTTOM LAYER SILK SCREEN COPPER LAYER



NOTES:

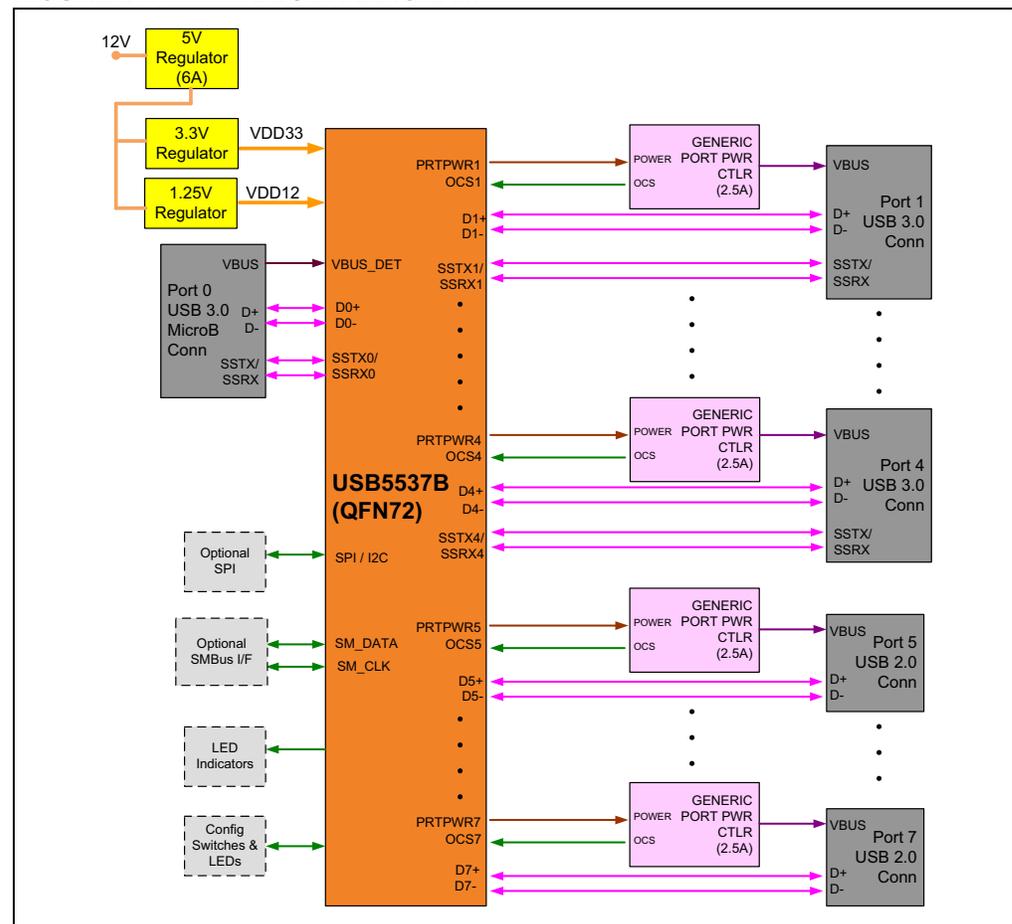
Chapter 2. Getting Started

2.1 EVB-USB5537 CONFIGURATION

The EVB-USB5537 provides different configuration options. It can be configured via default internal register settings, downloadable external firmware to an on board SPI Flash, through SMBus, or through the onboard configuration switches. When configured with the default internal register settings, the device operates as a USB 3.0/2.0 hub with seven battery charge enabled USB ports and Microchip-SMSC's standard VID/PID/DID settings.

A block diagram of the EVB-USB5537 is shown in Figure 2-1.

FIGURE 2-1: BLOCK DIAGRAM



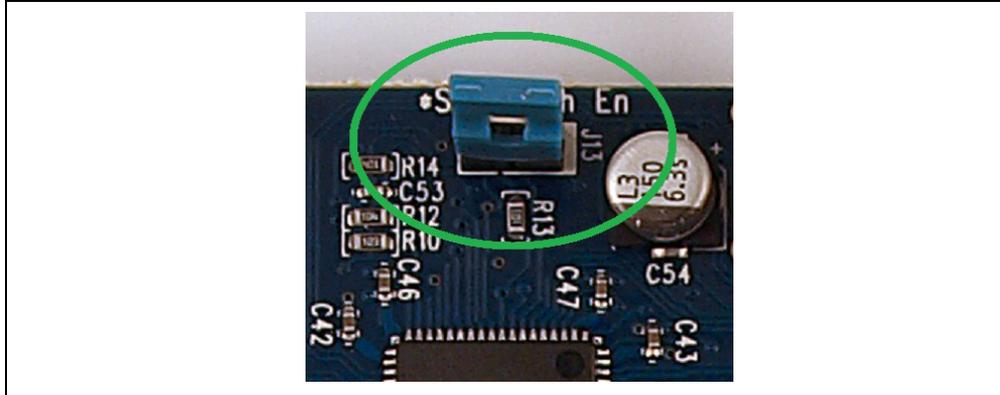
2.2 CONFIGURATION SOURCE – INTERNAL DEFAULT

When the USB5537B-60xx does not detect a valid SPI Flash image or SMBus configuration upon power-up, the EVB-USB5537 uses internal default register settings. It also sets the Vendor ID, Product ID, Language ID, Device ID, and additional settings from internal ROM code.

2.3 CONFIGURATION SOURCE – EXTERNAL SPI FLASH AND SMBUS

Upon power-up, the USB5537B-60xx first looks for an external SPI Flash device with a valid Firmware image loaded. If one is found, the external ROM is enabled and code execution is then initiated from the external SPI device. If a SPI Flash device is not found, the USB5537B-60xx will operate from the internal ROM. After booting to internal or external ROM, the firmware checks to see whether SMBus is enabled. The SMBus can operate in either legacy mode (USB 2.0 only) or advanced mode (access to both USB 2.0 and USB 3.0 registers). Note that the default configuration is for SMBus to operate in advanced mode.

FIGURE 2-2: SPI DEVICE ENABLED (J13)



By default, the SPI Flash chip, U11 is populated. The 10 kOhm pull up resistors (R74 and R75) on the SPI device's Write Protect (nWP) and Hold (nHOLD) pins must also be populated in order to use external flash. The 10 kOhm pull-up resistor (R13) on the SPI_SPD_SEL pin of the USB5537B-60xx must also be populated in order to select 60MHz SPI operation, as opposed to 30MHz operation. Additionally, the J13 *SPI Flash Enable* header is shorted by default in order to enable the SPI device. If the user wanted to disable the SPI device for any reason, the jumper from the J13 *SPI Flash Enable* header would have to be removed. The external flash can be programmed using the Microchip ProTouch MPT software tool which can be downloaded from the Microchip website at <http://www.Microchip.com/ProTouch>.

SMBus data and clock can be controlled via the onboard SMBus header, J15. The SMBus interface is disabled by default through the 100 kOhm pull-down resistor (R58) on the SM_CLK pin of the USB5537B-60xx. In order to enable SMBus communication, a valid SMBus host must be connected and SM_CLK must be pulled high through a 10 kOhm resistor. This can be achieved by shorting pins 1 and 2 on the J14 *Manual SMBus EN* header. Alternatively, if an Aardvark tool is inserted into the J15 SMBus I/F header, this tool will automatically pull SM_CLK high and then the J14 *Manual SMBus EN* header does not need to be shorted (or installed). When SMBus is enabled, the USB5537B-60xx configures the GPIOs to act as an SMBus slave. As an SMBus slave, the USB5537B-60xx will wait indefinitely for the SMBus configuration. If no external options are detected, the USB5537B-60xx will be configured from the internal default registers.

Note: Refer to the Protouch MPT User Manual on using this software to program the configuration.

2.4 POWER SOURCE – SELF-POWERED

The EVB-USB5537 supports only self-powered operation and is powered through one +12.0V regulated external power supply. The +12.0V external DC power supply plugs into the 2.5 mm connector, J11 on the board. Alternatively, an external voltage can be injected onto the J10 *Ext. 12V* header, which is not populated by default. The +12.0V feeds a 6A regulator which outputs +5.25 V across the board. This +5.25 V output is the input to the +3.3 V and +1.25 V onboard regulators as shown in Figure 2-1.

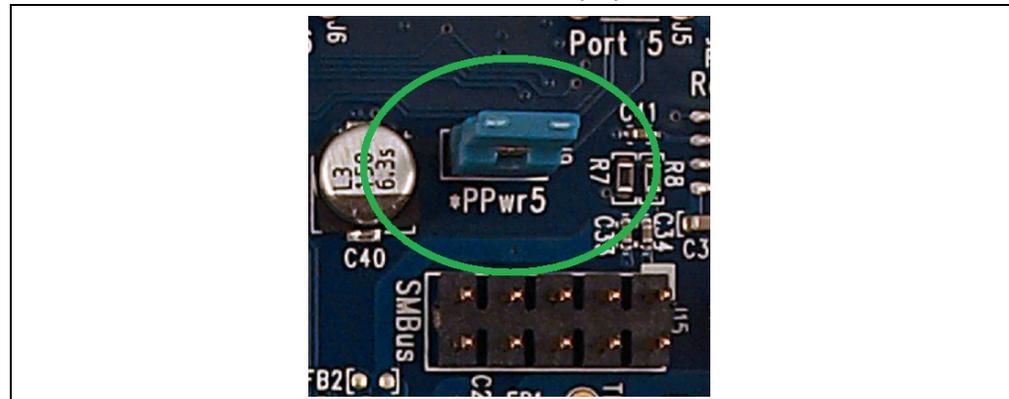
2.5 DOWNSTREAM PORT POWER CONTROL

Each of the seven USB downstream port powers are controlled via a 2.5 A port power device with an auto-discharge function (AP2511). The higher current capabilities of these AP2511 devices allow for all seven downstream ports to support battery charging up to a maximum of 5 A total at any one time.

The AP2511 devices connected to downstream ports 1 through 4 (U5 - U8) are enabled via the PRT_CTL[4:1] pins on the USB5537B-60xx. Downstream ports 1 through 4 also have individual overcurrent sensing available.

The AP2511 devices connected to downstream ports 5 through 7 (U10, U12 and U13) have several options for how they can be controlled. By default, the AP2511 “Enable” pins for these ports are pulled high through 10 kOhm resistors (R64, R73 and R76). Additionally, these enable pins are connected to the PRT_CTL[7:5] pins on the USB5537B-60xx. The PRT_CTL pins can either drive the enable pins of the port power controllers high to enable or low to disable the port power controllers. Note that in order for PRT_CTL5 to control the U13 port power controller, pins 1 and 2 of the J9 *PPwr5* header must be shorted together.

FIGURE 2-3: PORT 5 POWER ENABLE (J9)

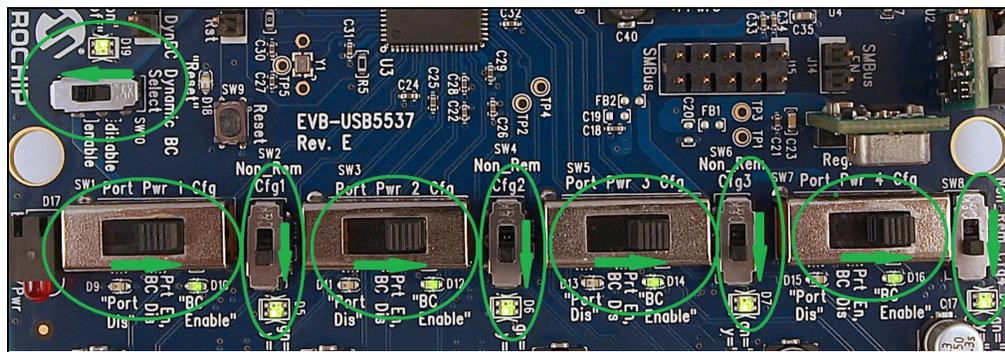


If the user wants to permanently enable these port power controllers for downstream ports 5 through 7, the jumper on J9 can be removed and the 0 Ohm resistors R81 and R69 can be removed. In this configuration, the AP2511 enable pins for these three ports will be permanently pulled high through the 10 kOhm, pull-up resistors mentioned above and therefore will always be turned on. They will no longer be controlled by the USB5537B-60xx. Downstream ports 5 through 7 have their overcurrent sense signals handled differently than from how ports 1 through 4 are handled. The OCS pins on the AP2511 devices for these three ports are connected to the port power control signals of the USB5537B-60xx. In order to view overcurrent sensing on downstream ports 5 through 7, first the PRT_CTL[7:5] pins must be tied to the enable pins of the AP2511 devices. Also, the 0 Ohm resistors R67, R72 and R86 must also be populated (which they are by default). This allows over current sensing capabilities on these three downstream ports. Another option available for downstream ports 5 through 7 is to gang the over current sense pins so that all OCS pins of the U10, U12 and U13 port power con-

trollers are tied together. In this configuration, the 0 Ohm resistors R67, R72 and R86 would then have to be removed and instead the 0 Ohm resistors R66, R71 and R82 would be installed. When these three resistors are populated, OCS for ports 5 through 7 are all tied together and are monitored on the OCS4 pin of the USB5537B-60xx. This is not the default configuration.

Before applying power to the EVB-USB5537, the first four USB 3.0 downstream ports must be properly configured through the onboard switches. All four downstream ports can be configured in a variety of ways described below. All of the OCS pins as well as the PRTCTL pins have configuration options available through these configuration switches. After the board has been powered, changing the position of these switches will not affect the current configuration. Any changes to the switches will require the EVB-USB5537 to have its power recycled or RESETn asserted before the changes can take affect. The sections below describe the different configuration options available for these USB5537B-60xx strap pins.

FIGURE 2-4: INITIAL CONFIGURATION



OCS Strap Options: Non-Removable Select

The OCS[4:1] pins of the USB5537B-60xx have strap options that are selectable through a 2-Position Double Pole Double Throw (DPDT) switch which are labeled “Non_Rem Cfg”. The OCS1 pin is associated with downstream Port 1 and is tied to SW2. When SW2 is in the default position, pins 1 and 2 are shorted together as well as pins 4 and 5 on the switch. This switch position pulls the OCS1 pin high to +3.3 V through a 10 kOhm resistor which configures downstream port 1 to be in the “Removable” state and its associated dual LED (D5) will be turned on green. To change this configuration, SW2 should be switched to the opposite position which will short pins 2 and 3 together as well as pins 5 and 6 on the switch. Once the switch position has been changed, power must be recycled on the EVB-USB5537. This switch position pulls the OCS1 pin low to ground through a 1 kOhm resistor which configures downstream port 1 to be in the “Non-Removable” state and the dual LED (D5) will now be turned on yellow.

This same selection process can be made to the OCS pins and switches that are tied to the downstream ports 2 through 4. The table below describes the different OCS strap options available for each of the first four OCS pins on the USB5537B-60xx.

Downstream Port	Associated Switch	Switch Position	OCS Config	LED
1	SW2	1-2, 4-5 = Removable (Default)	OCS1 Pulled High	D5 = Green
		2-3, 5-6 = Non Removable	OCS1 Pulled Low	D5 = Yellow
2	SW4	1-2, 4-5 = Removable (Default)	OCS2 Pulled High	D6 = Green
		2-3, 5-6 = Non Removable	OCS2 Pulled Low	D6 = Yellow
3	SW6	1-2, 4-5 = Removable (Default)	OCS3 Pulled High	D7 = Green
		2-3, 5-6 = Non Removable	OCS3 Pulled Low	D7 = Yellow
4	SW8	1-2, 4-5 = Removable (Default)	OCS4 Pulled High	D8 = Green
		2-3, 5-6 = Non Removable	OCS4 Pulled Low	D8 = Yellow

FIGURE 2-5: REMOVABLE STATE (DEFAULT)

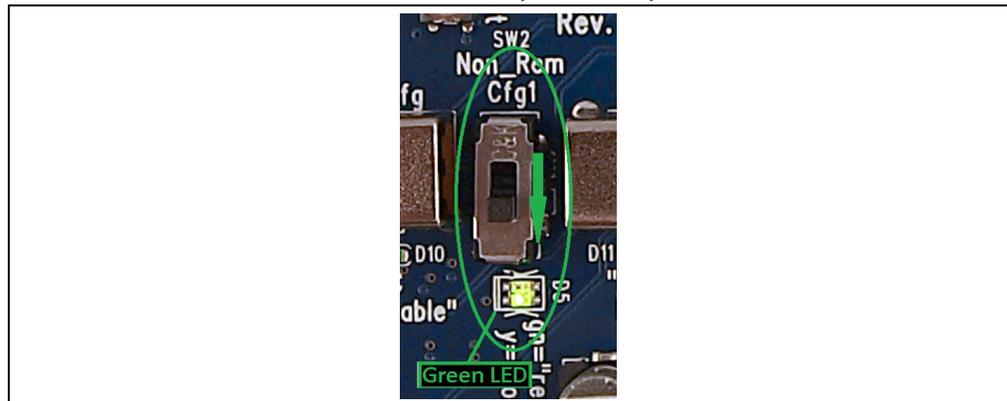


FIGURE 2-6: NON-REMOVABLE STATE



Port Power Strap Options: Battery Charge Enable and Port Disable Select

The PRTCTL[4:1] pins of the USB5537B-60xx also have strap options that are selectable through a 3-Position Double Pole Double Throw (DPDT) switch which are labeled “Port Pwr Cfg”. The PRT_CTL1 pin is associated with downstream Port 1 and is tied to SW1. When SW1 is in the default position, pins 1 and 2 are shorted together as well as pins 4 and 5 on the switch. This switch position pulls the PRT_CTL1 pin high to +3.3 V through a 10 kOhm resistor which configures downstream port 1 to be in the “Battery Charge Enabled” state and its associated LED (D10) will be turned on green. Alternatively SW1 can be positioned all the way down to the “Port Dis” position. This switch position short pins 2 and 3 together as well as pins 5 and 6 on the switch. This switch

position pulls the PRT_CTL1 pin low to ground through a 1 kOhm resistor which configures downstream port 1 to be disabled and therefore no power will be applied to VBUS on this downstream port. Also the "Port 1 Disable" LED (D9) will turn on red. If SW1 is switched into the middle OFF position, labeled as "Prt En, BC Dis" on the EVB-USB5537, the port power controller on downstream port 1 will act as a standard non-battery charging Port Power Controller (PPC). Note again that any time the switch position has been changed, power must be recycled on the EVB-USB5537.

This same selection process can be made to the PRTCTL pins and switches that are tied to downstream ports 2 through 4. Note that in either configuration mode, as long as the switch is not in the OFF position, the downstream port power LEDs (D1-D4) will light up green whenever power is being applied to VBUS on the associated downstream port. Additionally, whenever power is being applied to VBUS on downstream ports 5 through 7 (which do not have switchable strap options available), the downstream port power LEDs (D20-D22) will also light up green. When the "Port Pwr Cfg" switch is switched into the middle OFF position, the associated downstream port power LED will be turned off which shows that no power is applied to that particular downstream port. The table below describes the different PRTCTL strap options available for each of the first four PRTCTL pins on the USB5537B-60xx.

Downstream Port	Associated Switch	Switch Position	PRTCTL Config	LED
1	SW1	1-2, 4-5 = BC Enabled (Default)	PPWR1 Pulled High	D10 = Green
		Middle = Port Enabled, BC Disabled	Standard PPC	None
		2-3, 5-6 = Port Disabled	PPWR1 Pulled Low	D9 = Red
2	SW3	1-2, 4-5 = BC Enabled (Default)	PPWR2 Pulled High	D12 = Green
		Middle = Port Enabled, BC Disabled	Standard PPC	None
		2-3, 5-6 = Port Disabled	PPWR2 Pulled Low	D11 = Red
3	SW5	1-2, 4-5 = BC Enabled (Default)	PPWR3 Pulled High	D14 = Green
		Middle = Port Enabled, BC Disabled	Standard PPC	None
		2-3, 5-6 = Port Disabled	PPWR3 Pulled Low	D13 = Red
4	SW7	1-2, 4-5 = BC Enabled (Default)	PPWR4 Pulled High	D16 = Green
		Middle = Port Enabled, BC Disabled	Standard PPC	None
		2-3, 5-6 = Port Disabled	PPWR4 Pulled Low	D15 = Red

FIGURE 2-7: BATTERY CHARGE ENABLED (DEFAULT)

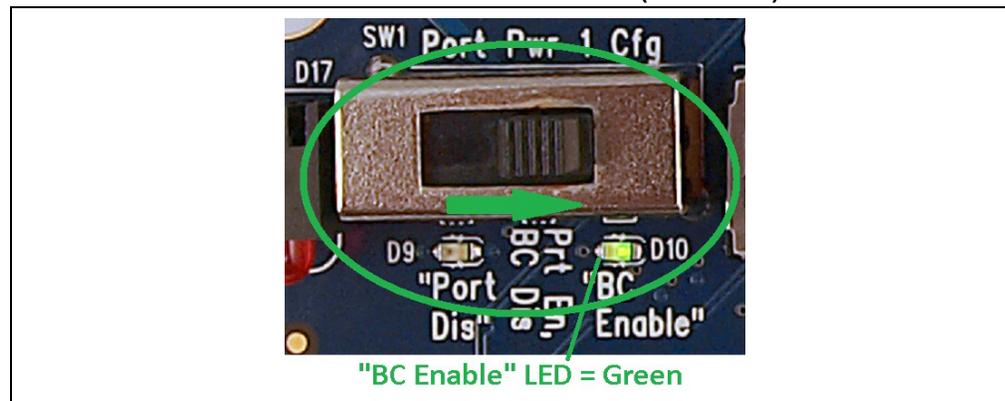


FIGURE 2-8: PORT ENABLED WITH BATTERY CHARGE DISABLED (STANDARD PORT POWER CONTROL FUNCTION)

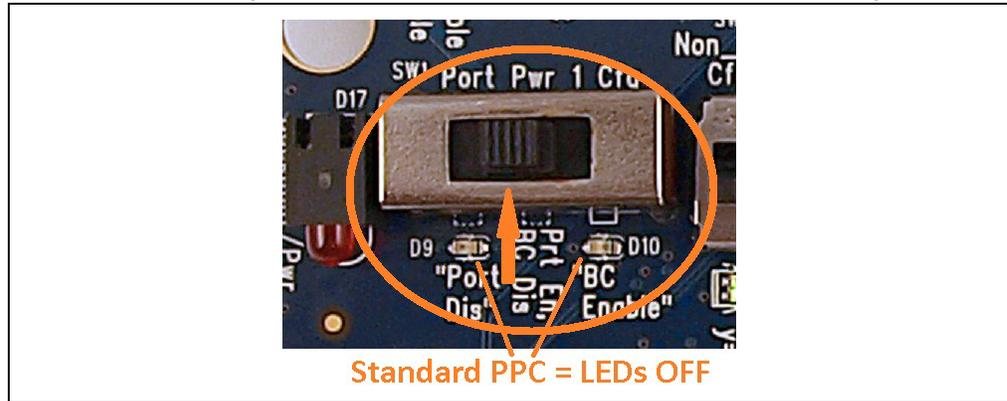
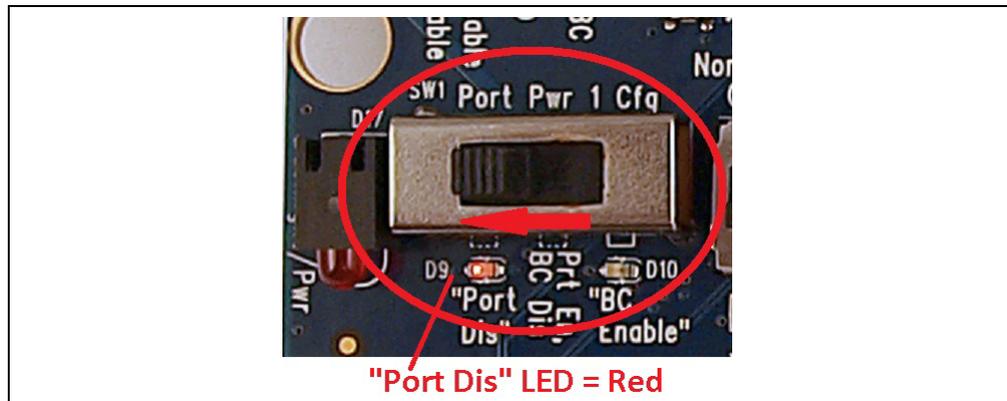


FIGURE 2-9: PORT DISABLED



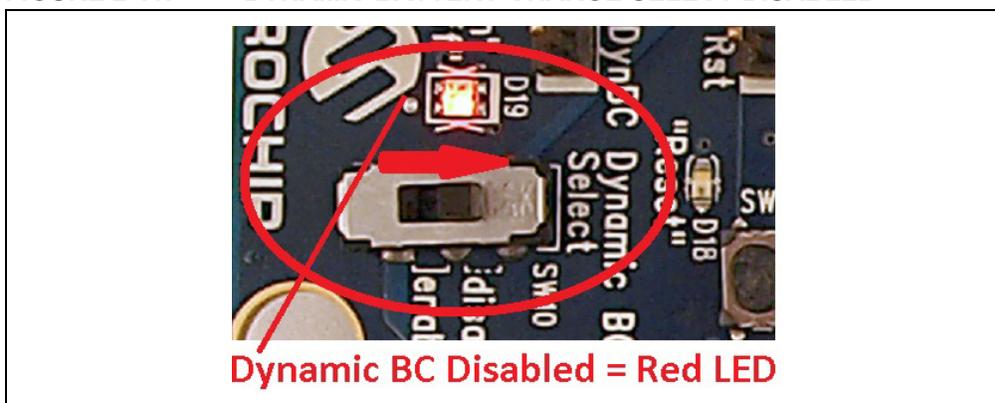
Dynamic Battery Charge Select

The final switch to consider when configuring the USB5537B-60xx is the "Dynamic BC Select" switch, SW10. Once each of the first four downstream ports have been configured in one of the options described above, the Dynamic Battery Charge Select switch can then be configured to either turn battery charging on for all BC Enabled ports, or turn battery charging off. To enable battery charging on all BC Enabled downstream ports, SW10 must be in the "Enable" position which shorts pins 1 and 2 and also pins 4 and 5 together on the switch (this is the default position). When battery charging is enabled, the DYNCPDISn (active low) pin on the USB5537B-60xx is pulled high to +3.3 V through two 4.7 kOhm resistors in series and the associated dual LED (D19) will turn on green. To disable battery charging on all downstream ports, SW10 must be in the "Disable" position which shorts pins 2 and 3 and also pins 5 and 6 together on the switch. When battery charging is disabled, the DYNCPDISn pin on the USB5537B-60xx is pulled low to ground through two 4.7 kOhm resistors in series and the associated dual LED (D19) will turn on red. An optional 2-pin *Ext. DYNBC* header is provided as well (J12) so that the user can inject a signal onto the DYNCPDISn pin through an external source.

FIGURE 2-10: DYNAMIC BATTERY CHARGE SELECT ENABLED (DEFAULT)



FIGURE 2-11: DYNAMIC BATTERY CHARGE SELECT DISABLED

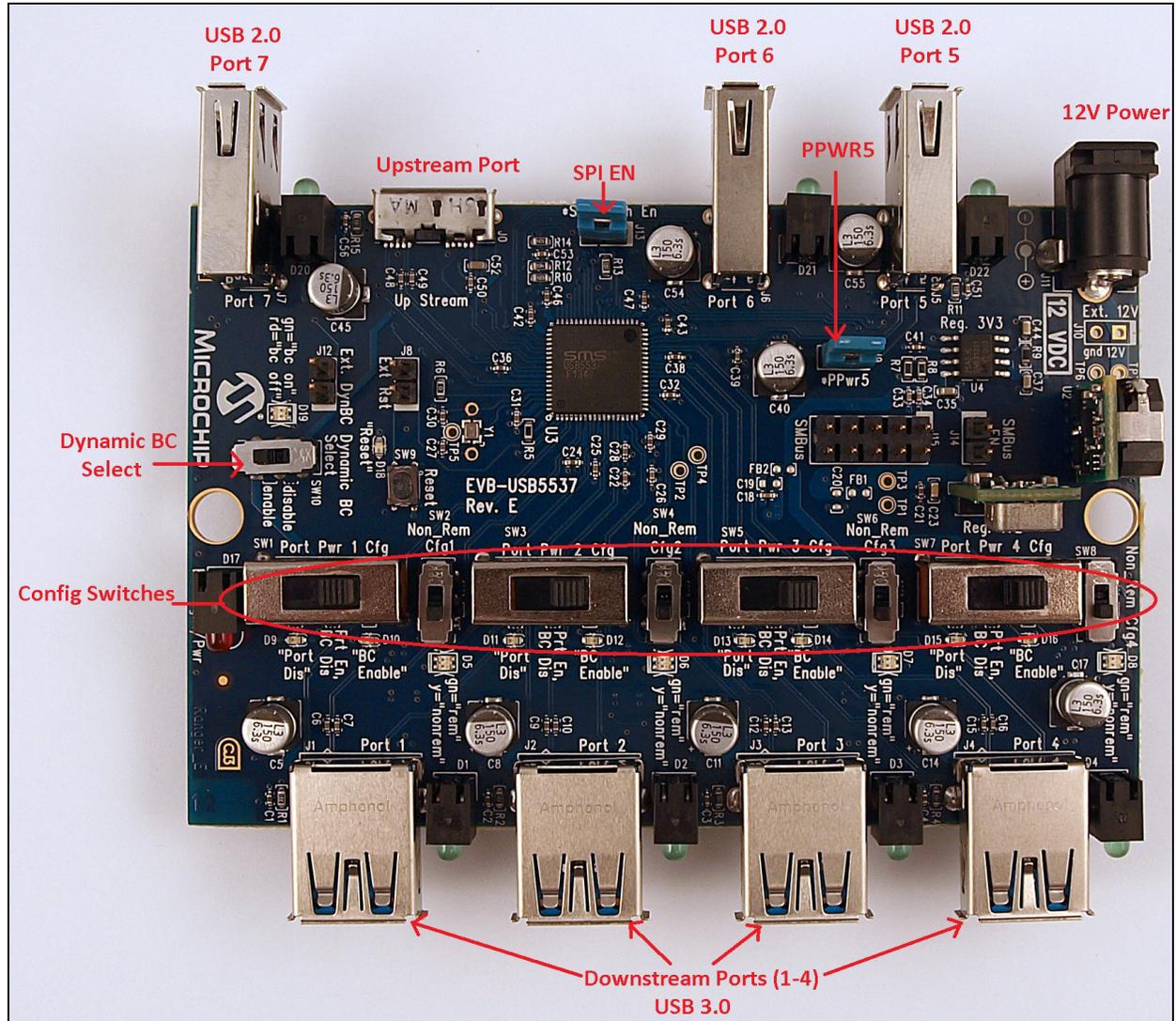


Appendix A. EVB-USB5537 Evaluation Board

A.1 INTRODUCTION

This appendix shows the EVB-USB5537 Evaluation Board.

FIGURE A-1: EVB-USB5537 EVALUATION BOARD



NOTES:

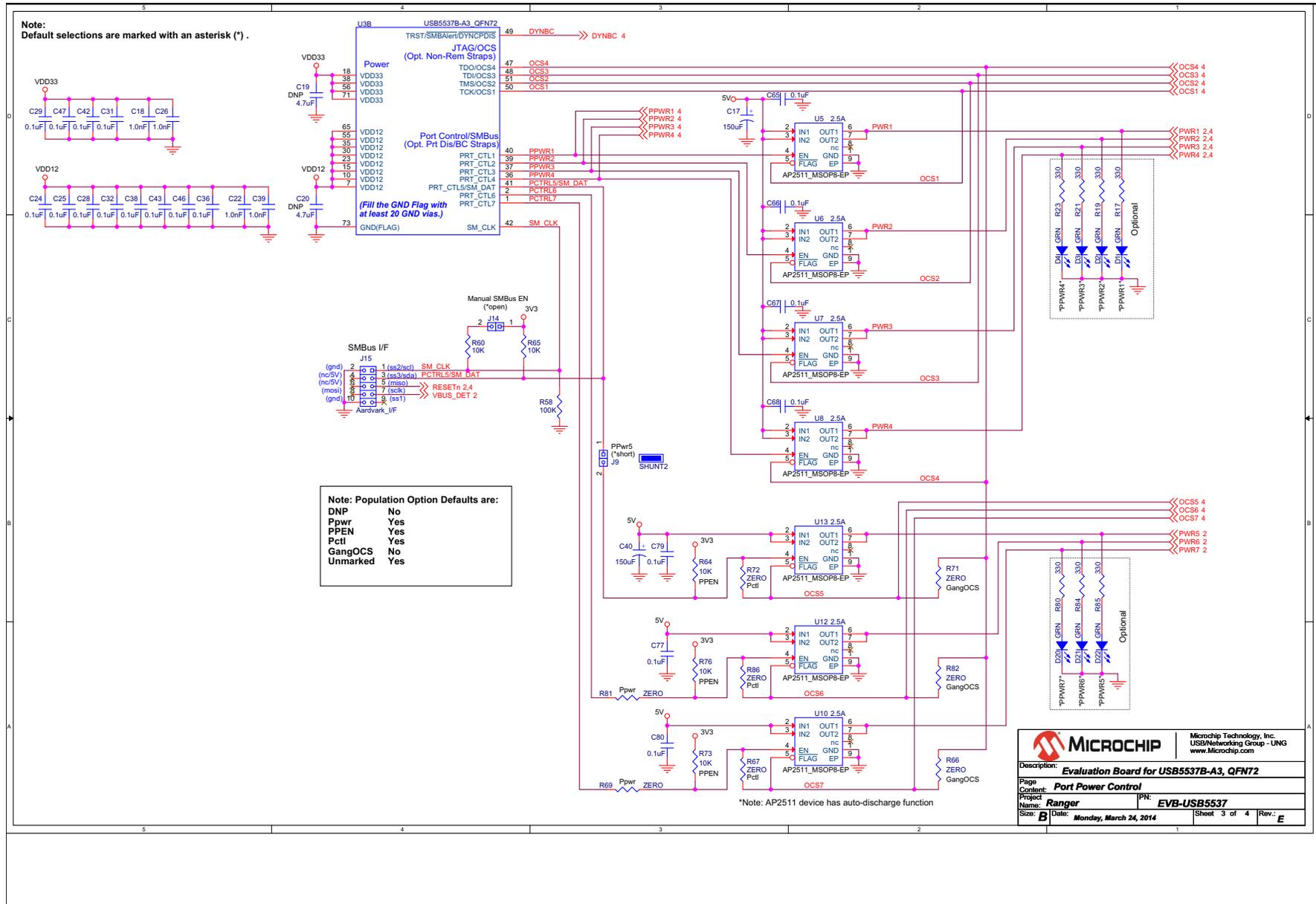


Appendix B. EVB-USB5537 Evaluation Board Schematics

B.1 INTRODUCTION

This appendix shows the EVB-USB5537 Evaluation Board schematics.

FIGURE B-2: EVB-USB5537 EVALUATION BOARD SCHEMATIC 2



NOTES:



Appendix C. Bill of Materials (BOM)

C.1 INTRODUCTION

This appendix includes the EVB-USB5537 Evaluation Board Bill of Materials (BOM).

TABLE C-1: EVB-USB5537 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number
1	9	9	C5,C8,C11,C14,C17,C40,C45,C54,C55	Capacitor, Low ESR, 150uF, 6.3VDC, 20%, Aluminum, Radial-SMT, 5mm x 5.7mm	Lelon	VZS151M0JTR-0506
2	41	41	C1,C2,C3,C4,C6,C7,C9,C10,C12,C13,C15,C16,C21,C24,C25,C28,C29,C31,C32,C34,C36,C38,C42,C43,C46,C47,C48,C49,C51,C56,C65,C66,C67,C68,C71,C76,C77,C78,C79,C80,C82	Capacitor, 0.1uF, 10V, 10%, X5R, 0402	Murata	GRM155R71A104KA01D
3	8	8	C18,C22,C26,C33,C39,C41,C50,C73	Capacitor, 1000pF, 50V, 10%, X7R, 0402	Murata	GRM155R71H102KA01D
4	2	2	C27,C30	Capacitor, 6pF, 50V, +/-0.5pF, NPO, 0402	Murata	GRM155C1H6R0DZ01D
5	1	1	C53	Capacitor, 0.01uF, 25V, 10%, X7R, 0402	Murata	GRM155R71E103KA01D
6	2	2	C35,C37	Capacitor, 4.7uF, 6.3VDC, 20%, X5R, 0603	Murata	GRM188R60J475KE19D
7	2	2	C23,C72	Capacitor, 10uF, 6.3VDC, 20%, X5R, 0603	Murata	GRM188R60J106ME47D
8	1	1	C44	Capacitor, 1.0uF, 16VDC, 10%, X5R, 0603	Murata	GRM188R61C105KA93D
9	1	1	C52	Capacitor, 2.2uF, 6.3VDC, 10%, X5R, 0603	Murata	GRM185R60J225KE26D
10	2	2	C70,C74	Capacitor, 10uF, 25 VDC, 10%, 0805	Murata	GRM21BR61E106KA73L
11	4	4	D5,D6,D7,D8	LED, Dual, Yellow/Green, SMT-0605	Lite-On	LTST-C195KGJSKT
12	1	1	D19	LED, Dual, Red/Green, SMT-0605	Lite-On	LTST-C195KGJRKT
13	5	5	D9,D11,D13,D15,D18	LED, Red, 0603	Stanley Electric	BR1111C-TR
14	4	4	D10,D12,D14,D16	LED, Green, 0603	Stanley Electric	BG1111C-TR
15	7	7	D1,D2,D3,D4,D20,D21,D22	LED, Green, 3mm, Diffused, 0.2" CL-vert, TH, Right Angle	Lumex	SSF-LXH103GD
16	1	1	D17	LED, Red, 3mm, Diffused, 0.2" CL-vert, TH, Right Angle	Lumex	SSF-LXH103ID
17	2	2	D23,D24	Diode, MMBD914LT, Fast Switching, 100VDC, 200mA, SOT-23	On Semiconductors	MMBD914LT1
18	2	2	FB3,FB4	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata	BLM18EG221SN1D
19	25	25	R1,R2,R3,R4,R11,R15,R17,R19,R21,R23,R24,R25,R26,R27,R33,R34,R36,R45,R51,R61,R68,R70,R80,R84,R85	Resistor, 330, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ331V
20	1	1	R5	Resistor, 12.0K, 1%, 1/16W, 0603	Panasonic	ERJ-3EKF1202V
21	1	1	R7	Resistor, 21.0K, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF2102V

TABLE C-1: EVB-USB5537 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number
22	1	1	R8	Resistor, 150K, 1%, 1/16W, 0603	Panasonic	ERJ-3EKF1503V
23	1	1	R9	Resistor, 47K, 5%, 1/16W, 0603	Yageo America	9C06031A4702JLHFT
24	15	15	R10,R13,R28,R29,R31,R38,R40,R42,R46,R49,R60,R65,R74,R75,R83	Resistor, 10K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ103V
25	3	3	R64,R73,R76	Resistor, 10K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ103V
26	4	4	R12,R14,R58,R63	Resistor, 100K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ104V
27	13	13	R30,R32,R35,R37,R39,R41,R43,R44,R47,R48, R50,R52,R55	Resistor, 1K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ102V
28	2	2	R53,R62	Resistor, 4.7K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ472V
29	1	1	R54	Resistor, 29.4K, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF2942V
30	1	1	R56	Resistor, 1.91K, 1%, 1/10W, 0603	Stackpole Electronics	RMCF0603FT1K91
31	1	1	R59	Resistor, 255, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF2550V
32	2	2	R6,R57	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V
33	3	3	R67,R72,R86	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V
34	2	2	R69,R81	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V
35	1	1	J11	Connector, Power Jack, 2.5 mm x 5.5 mm, 12 V, 4 A, Right Angle, TH	Cui Stack	PJ-002BH
36	4	4	J1,J2,J3,J4	Receptacle, USB 3.0, Style A, Right Angle, Through-hole	Amphenol	GSB311131HR
37	1	1	J0	Receptacle, USB 3.0, Style MicroB, Right Angle, SMT	Hirose Electric Co Ltd.	ZX360D-B-10P
38	3	3	J5,J6,J7	Receptacle, USB, Style A, Upright, Right Angle, Through-hole	Samtec	USB-A-S-S-B-VU
39	5	5	J8,J9,J12,J13,J14	Header, 1 x 2, 0.1 Inch, Vertical	FCI	68000-236HLF
40	1	1	J15	Header, 2 x 5, 0.1 Inch, Vertical	FCI	67996-272HLF
41	4	4	SW1,SW3,SW5,SW7	Switch, 3POS, DPDT, Slide, Mini, Top Actuator, TH	APEM	MHS223
42	5	5	SW2,SW4,SW6,SW8,SW10	Switch, DPDT, Slide, Sub-Mini, Top Actuator, TH	C&K	JS202011CQN
43	1	1	SW9	Switch, Momentary, SPST, 50mA, J-lead, NO, Micro-Mini	C&K Components	PTS810 SJM 250 SMTR LFS
44	1	1	U1	IC, DC-DC Converter Module, 0.591-6 Vout, ~12 Vin, 0.591-6 VDC out, 3A, 5 pin SIP, 0.41" Wide	Murata	OKR-T/3-W12-C
45	1	1	U2	IC, DC-DC Converter Module, 0.591-6 Vout, ~12 Vin, 0.591-6 VDC out, 6A, 5 pin SIP, 0.41" Wide	Murata	OKR-T/6-W12-C

TABLE C-1: EVB-USB5537 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number
46	1	1	U3	IC, USB5537B, USB 2.0 and 3.0 Hub, 7-port, QFN72	SMSC	USB5537B_QFN72
47	1	1	U4	IC, MCP1725-ADJE/SN, LDO Regulator, Adj., 500 mA, SOIC8	Microchip	MCP1725(T)-ADJE/SN
48	7	7	U5,U6,U7,U8,U10,U12,U13	IC, AP2511MP-13, Power Distribution Switch, MSOP-8EP	Diodes Inc.	AP2511MP-13
49	1	1	U9	IC, 74LVC1G14, Inverter, Shottky, DCK	TI	SN74LVC1G14DCKR
50	1	1	U11	IC, Flash, SPI, SST25VF064C, 64Mb (8M x 8), 2.7V-3.3V, 75MHz (Dual Read), SO8	Microchip	SST25VF064C-80-4I-S3AE
51	1	1	Y1	Crystal, 25.000MHz, 30ppm, 6pF, SMT 2.0MM X 1.6MM	Murata	XRCGB25M000F3M00R0
52	4	4	-none	Foot, Silicone Rubber, Adhesive, Clear, Cylindrical, .500"x.250"	Bumper Specialties	RBS-6
53	1	1	LBL-ASSY1	Label, Assembly Number, Laminated, 250 x 800, "EVB-USB5537_E"	Brother	1/4" x 0.8"
54	1	1	LBL-SERNO	Label, Serial Number, Laminated, 250 x 800	Brother	1/4" x 0.8"
55	1	1	PCB Fab	PCB, Ranger (EVB-USB5537), Rev. E		Ranger_E
56	15	0	C57,C58,C59,C60,C61,C62,C63,C64,C69,C75,C81,C83,C84,C85,C86	Capacitor, 0.1uF, 10V, 10%, X5R, 0402	Murata	GRM155R71A104KA01D
57	2	0	C19,C20	Capacitor, 4.7uF, 6.3VDC, 20%, X5R, 0603	Murata	GRM188R60J475KE19D
58	2	0	FB1,FB2	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata	BLM18EG221SN1D
59	7	0	R16,R18,R20,R22,R77,R78,R79	Resistor, 1K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ102V
60	3	0	R66,R71,R82	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V
61	1	0	J10	Header, 1 x 2, 0.1 Inch, Vertical	Samtec	TSW-102-14-L-S
62	2	0	SHUNT1,SHUNT2	Shunt, Insulated, 0.1 Inch	TE Connectivity	881545-2

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