EVB-USB2642 Evaluation Board User's Guide

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Object of Declaration: EVB-USB2642 Evaluation Board

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

Derek Carlson
VP Development Tools

16-July-2013
Date

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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-USB2642 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-USB2642 Evaluation Board as a development tool for the USB2642 USB 2.0 hub and flash media card controller combo. The manual layout is as follows:

- **Chapter 1. "Overview"** – Shows a brief description of the EVB-USB2642 Evaluation Board.
- **Chapter 2. "Getting Started"** – Includes instructions on how to get started with the EVB-USB2642 Evaluation Board.
- **Appendix A. "EVB-USB2642 Evaluation Board"** – This appendix shows the EVB-USB2642 Evaluation Board.
- **Appendix B. "EVB-USB2642 Evaluation Board Schematics"** – This appendix shows the EVB-USB2642 Evaluation Board schematics.
- **Appendix C. "Bill of Materials (BOM)"** – This appendix includes the EVB-USB2642 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	*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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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM assembler); all MPLAB linkers (including MPLINK object linker); and all MPLAB librarians (including MPLIB object librarian).
- **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.

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 (October 2013)

- Initial Release of this Document.

Chapter 1. Overview

1.1 INTRODUCTION

The USB2642 evaluation board contains an Ultra Fast USB 2.0 Multi-Format Flash Media Controller, a USB hub combo and a USB Port Power Controller with charger emulation. The USB2642 evaluation board demonstrates a stand-alone application platform for developers of breakout box designs that extend the I²C™ or Secure Digital Input Output (SDIO) ports of the microcontroller into the breakout box over the upstream USB connection.

The USB2642 is compatible with the following operating systems:

- Windows® 8 and 8.1
- Windows 7
- Windows Vista™
- Windows XP
- Windows ME (Millennium Edition)
- Windows 2000 SP4
- Mac OS® X
- Linux® Mass Storage Class Drivers

1.2 FEATURES

- 48-pin QFN (RoHS compliant) package
- Supports these media types:
  - Secure Digital (SD™)
  - MultiMediaCard™ (MMC) 4-bit/8-bit interfaces
- Two USB 2.0 downstream hub ports, one with an individual port power and the other with a USB Port Power Controller with charger emulation, the USC81001
- Supports external configuration:
  - External SPI flash for USB downloadable firmware
  - External certification chip
  - SMBus header for additional firmware download
  - External I²C EEPROM for configuration options
- Operates from a single voltage (+5.0 VDC, regulated) external DC power supply
- Internal FET power switch for all media types
- Multiple LED indicators:
  - Activity LED indicator
  - Card power LED indicator
  - Optional +3.3 VDC power LED indicator
  - Port power LED
  - Alert LED (Port 3)
- Single crystal clock source
- Single on board +3.3 VDC regulator
- USB-IF BC1.2, YD/T-1591 (2009) and RIM charging profiles (Port 3)

- Charging profiles (Port 3) suitable for iPhone®, iPad®, and iPod®
- 2.5A maximum current (Port 3)
- Active Current limiting and monitoring (Port 3)

1.3 GENERAL DESCRIPTION

The EVB-USB2642 is a demonstration and evaluation platform featuring the USB2642 Ultra Fast USB 2.0 Multi-Format Flash Media Controller, the UCS1001 Port Power Controller with charger emulation and the USB hub combo on a 4-layer RoHS compliant Printed Circuit Board (PCB). It is designed to support internal default settings, an external certification chip, an SMBus header interface and an SPI flash both for external firmware download, and also an external I^2C EEPROM for customized functionality.

An 8-Mbit SPI flash device can be populated on the evaluation board to provide firmware updates via USB by using the provided USBDM utility. For more information, please see the USBDM manual.

The default configuration can be changed by the SPI flash device, the SMBus header interface or the external certification chip. Alternatively, the default configuration can be changed by installing an EEPROM into the provided footprint. When this is done, the SPI flash device must be removed to avoid signaling conflicts. Figure 1-1 and Figure 1-2 show the top and bottom level silk screen and copper layers, respectively.

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

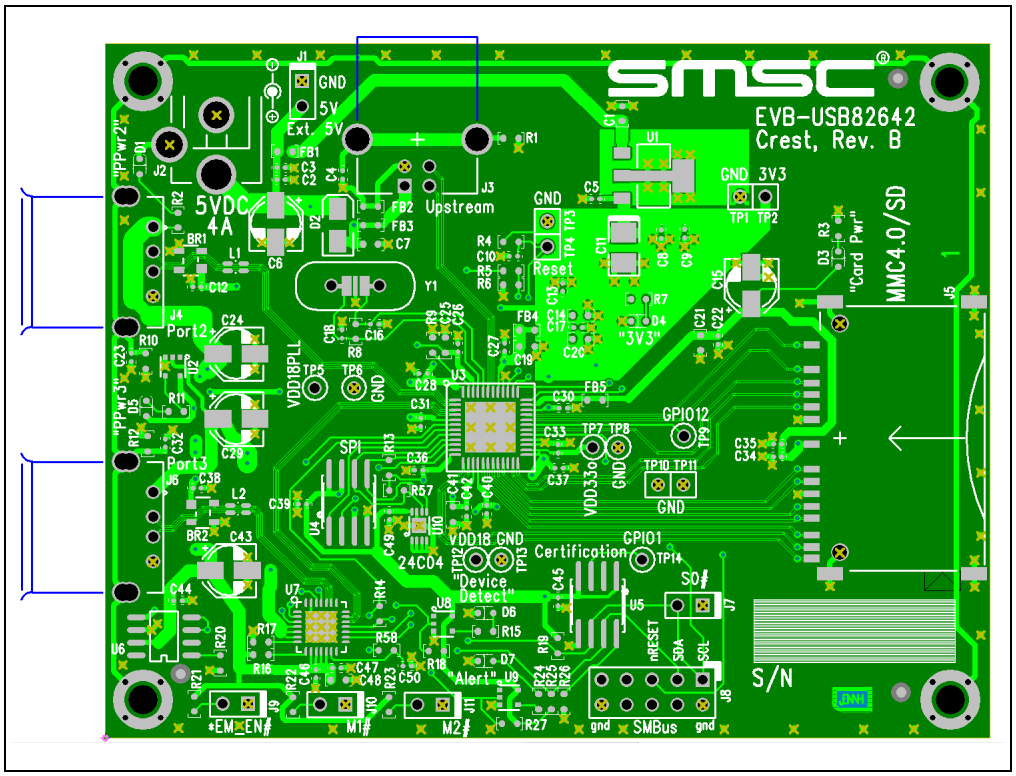
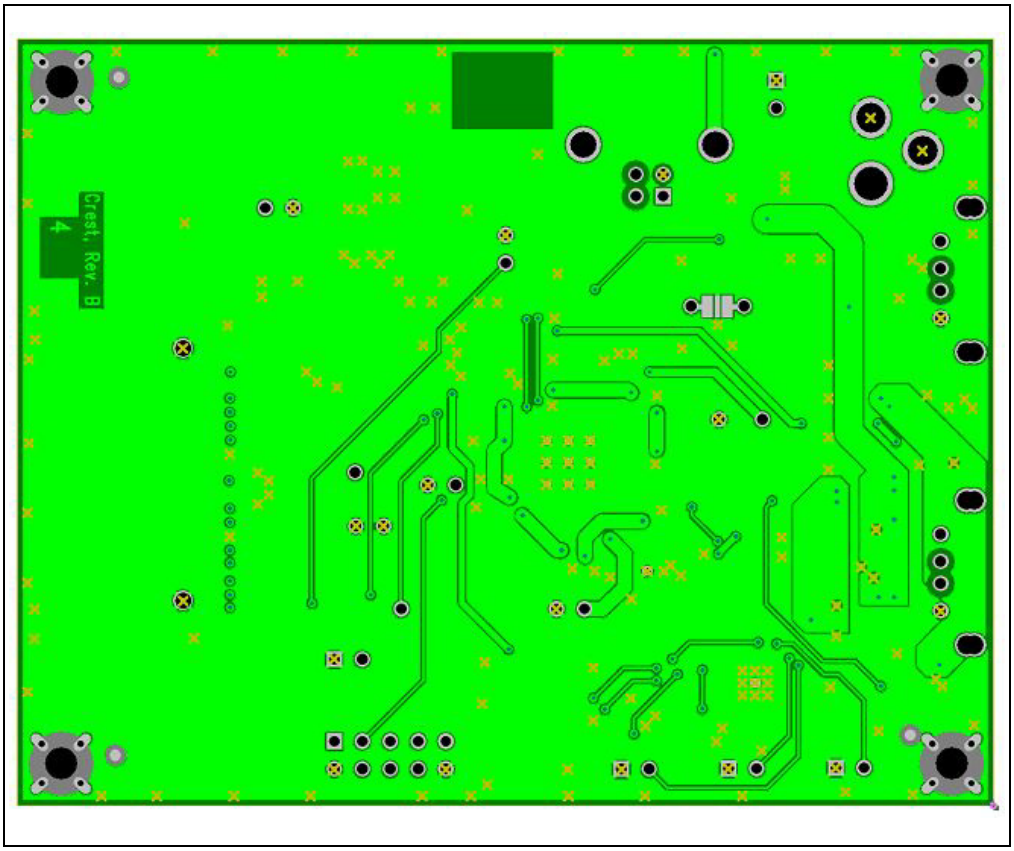


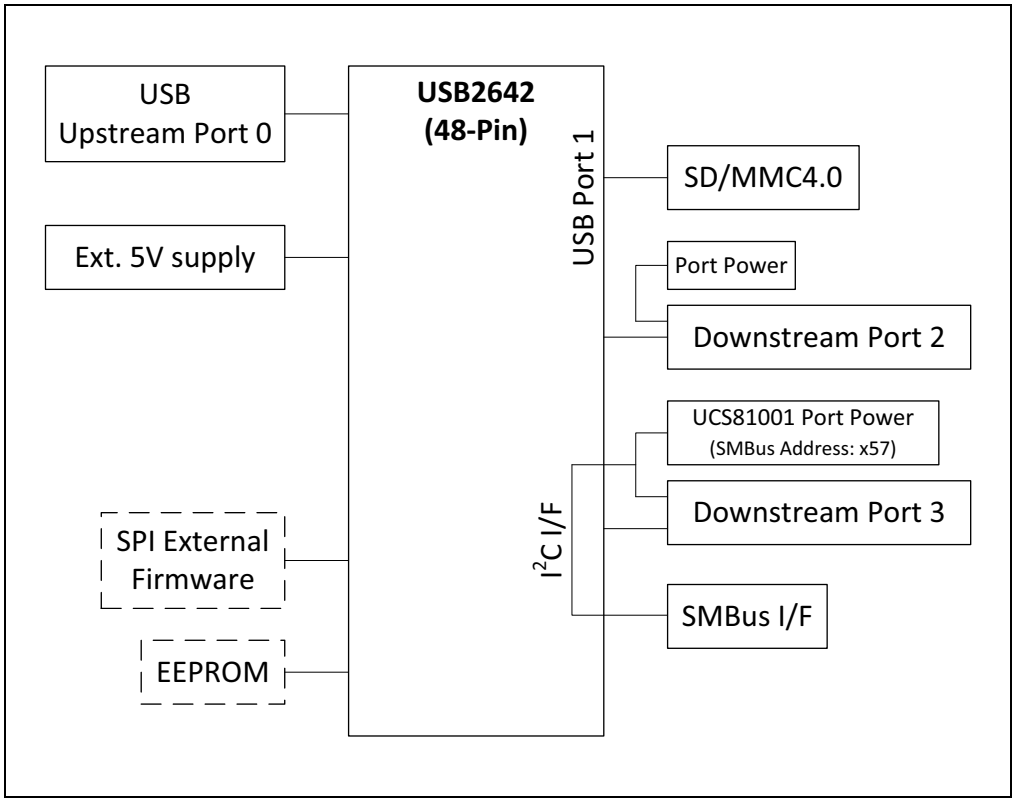
FIGURE 1-2: BOTTOM LEVEL SILK SCREEN AND COPPER LAYERS



1.4 FUNCTIONAL BLOCK DIAGRAM

The USB2642 consists of the blocks shown in the diagram below.

FIGURE 1-3: FUNCTIONAL BLOCK DIAGRAM



Chapter 2. Getting Started

2.1 INTRODUCTION

The EVB-USB2642 is configured by internal default registers. In this default configuration, it operates as a USB 2.0 combo device with a 3-port USB hub (two external ports) and a Flash Media Controller with standard VID/PID/DID settings and USB to I^2C bridge ability.

The UCS1001 on port 3 is configured to the data Pass-Through mode by default.

2.2 EVB-USB2642 CONFIGURATION

The EVB-USB2642 is designed for flexible configuration solutions. It may be configured to operate with default internal register settings, USB host downloadable configuration via SMBus header interface or EEPROM or USB host downloadable external firmware to an SPI flash.

The UCS81001 can be configured using the J9, J10, J11 jumpers at startup or via the EVB-USB2642 GUI. In the default mode, M1, M2 and EM_EN are set to '100'.

TABLE 2-1: ACTIVE MODE SELECTION

#	M1	M2	EM_EN	Active Mode
1	0	0	1	Dedicated Charger Emulation Cycle
2	0	1	0	Data Pass-through
3	0	1	1	BC1.2 DCP
4	1	0	0	BC1.2 SDP[1]
5	1	0	1	Dedicated Charger Emulation Cycle
6	1	1	0	Data Pass-through
7	1	1	1	BC1.2 CDPDta

Note 1: Per the BC1.2 specification, BC1.2 SDP behaves the same as the Data Pass-Through mode with the exception that it is preceded by a VBUS discharge when the mode is entered.

For more information, please visit the UCS1001 page.

When the EVB-USB2642 does not detect an EEPROM or a valid SPI flash image upon power-up, the EVB-USB2642 uses internal default register settings. It sets the Vendor ID, Product ID, Language ID, Device ID and a few other selections from internal ROM code.

2.2.1 Configuration Source – External Certification Chip

When an iPhone, iPad or iPod is connected to the USB2642 evaluation board's USB interface, the external certification chip can communicate via the upstream microprocessor over the USB to I^2C bridge to certify the system. If other devices are attached, the external certification chip is not involved in the data communication between the control application and attached device.

Note: If the certification chip is installed, the 10.0 kΩ pull down resistor R26 must also be installed.

2.2.2 Configuration Source – External SPI Flash

The installed SPI flash is initially blank. In this scenario, the internal firmware will execute. External firmware updates can be downloaded via USB using the utility USBDM to the SPI flash. After downloading, the EVB-USB2642 will execute from the SPI flash.

Note: If the SPI flash is installed, the 10.0 kΩ pull up resistor R13 must also be installed.

2.2.3 Configuration Source – External EEPROM

Upon power-up, the EVB-USB2642 looks for an attached EEPROM on its I^2C interface. The EVB-USB2642 provides a footprint at U10 where an external EEPROM (embedded in a DFN8 package of type 24C0x) can be soldered to customize the Media Controller's settings. The EEPROM contains 512 bytes of user customizable settings. Among the settings are Vendor ID, Product ID and Device ID numbers. To use the EEPROM, the SPI flash device U4 must be removed first.

Note: If the EEPROM is installed, the 10.0 kΩ pull up resistor R13 must also be installed.

2.2.4 Configuration Source – USB Upstream

The EEPROM supporting the USB2642 is configured with the USBDM configuration tool via a USB2642 cable connected to the upstream connector. This tool allows for modification of Vendor ID, Product ID, Language ID, Device ID and other configuration settings.

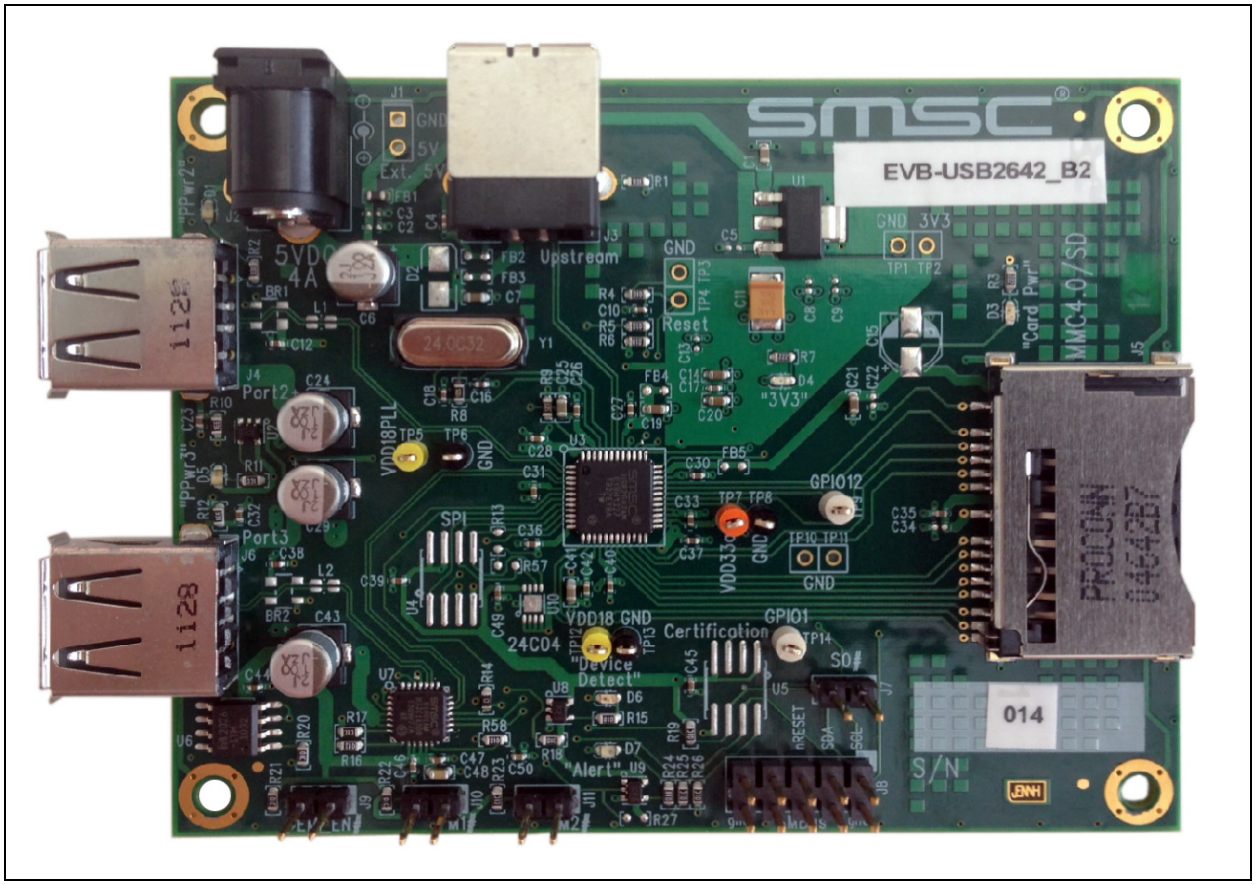
For more information, please see the USBDM manual.

Appendix A. EVB-USB2642 Evaluation Board

A.1 INTRODUCTION

This appendix shows the EVB-USB2642 Evaluation Board.

FIGURE A-1: EVB-USB2642 EVALUATION BOARD



NOTES:

Appendix B. EVB-USB2642 Evaluation Board Schematics

B.1 INTRODUCTION

This appendix shows the EVB-USB2642 Evaluation Board schematics.

FIGURE B-1: EVB-USB2642 EVALUATION BOARD SCHEMATIC 1

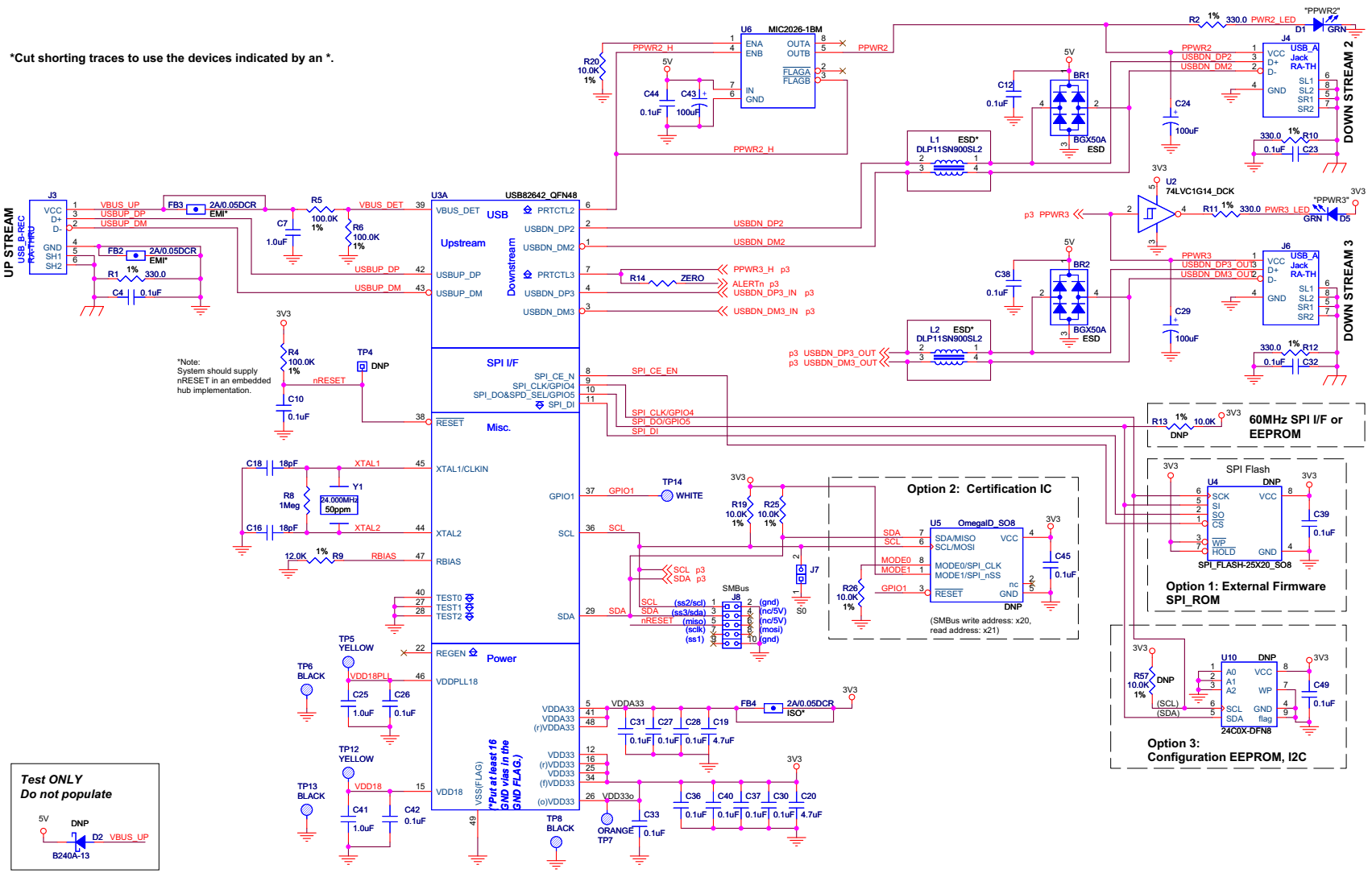
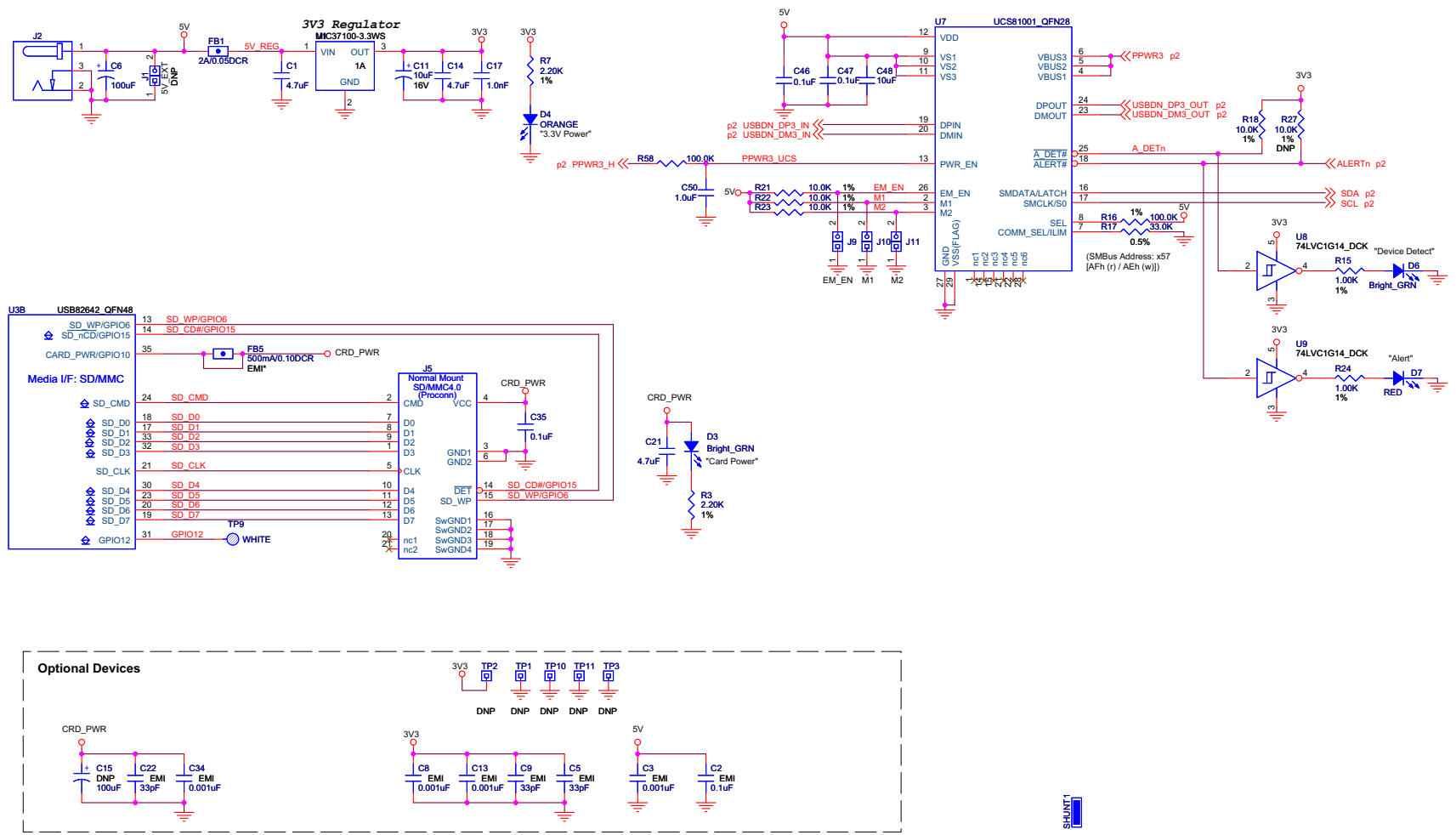


FIGURE B-2: EVB-USB2642 EVALUATION BOARD SCHEMATIC 2



NOTES:

Appendix C. Bill of Materials (BOM)

C.1 INTRODUCTION

This appendix includes the EVB-USB2642 Evaluation Board Bill of Materials (BOM).

TABLE C-1: EVB-USB2642 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number
1	5	C1, C14, C19, C20, C21	Capacitor, 4.7uF, 6.3VDC, 20%, X5R, 0603	Murata Electronics®	GRM188R60J475KE19D
2	23	C4, C10, C12, C23, C26, C27, C28, C30, C31, C32, C33, C35, C36, C37, C38, C39, C40, C42, C44, C45, C46, C47, C49	Capacitor, 0.1uF, 10V, 10%, X5R, 0402	Murata Electronics	GRM155R71A104KA01D
3	1	C50	Capacitor, 1.0uF, 6.3VDC, 10%, X5R, 0402	Murata Electronics	GRM155R60J105KE19D
4	4	C6, C24, C29, C43	Capacitor, Low ESR, 100uF, 6.3VDC, 20%, Aluminum, Radial-SMT, 5mm x 5.8mm	United Chemi-Con	EMZA6R3ADA101ME61G
5	3	C7, C25, C41	Capacitor, 1.0uF, 16VDC, 10%, X5R, 0603	Murata Electronics	GRM188R61C105KA93D
6	1	C11	Capacitor, Low ESR, 10uF, 16VDC, 10%, Tantalum, EIA-B	Kemet	B45190E3106K209
7	2	C16, C18	Capacitor, 18pF, 50V, 5%, NPO, 0402	Murata Electronics	GRM1555C1H180JZ01
8	1	C17	Capacitor, 1000pF, 50V, 10%, X7R, 0402	Murata Electronics	GRM155R71H102KA01D
9	1	C48	Capacitor, 10uF, 6.3VDC, 20%, X5R, 0603	Murata Electronics	GRM188R60J106ME47D
10	5	R1, R2, R10, R11, R12	Resistor, 330, 1%, 1/10W, 0603	Panasonic®	ERJ-3EKF3300V
11	2	R3, R7	Resistor, 2.20K, 1%, 1/16W, 0603	Yageo America	9C06031A2201FKHFT
12	5	R4, R5, R6, R16, R58	Resistor, 100K, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF1003V
13	1	R8	Resistor, 1Meg, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ105V
14	1	R9	Resistor, 12.0K, 1%, 1/16W, 0603	Panasonic	ERJ-3EKF1202V
15	1	R14	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V
16	2	R15, R24	Resistor, 1.00K, 1%, 1/16W, 0603	Yageo America	9C06031A1001FKHFT
17	1	R17	Resistor, 33K, 0.5%, 1/10W, 0603	Yageo America	RT0603DRD0733KL
18	8	R18, R19, R20, R21, R22, R23, R25, R26	Resistor, 10.0K, 1%, 1/16W, 0603	Rohm	MCR03EZHF1002
19	2	D1, D5	LED, Green, 0603	Stanley Electric	BG1111C-TR
20	2	D3, D6	LED, Bright Green, 0603	Rohm	SML-412MWT86
21	1	D4	LED, Orange, 14mcd, 20mA, 0603	Osram	LOL29KJ2L124Z
22	1	D7	LED, Red, 0603	Stanley Electric	BR1111C-TR
23	1	FB1	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata Electronics	BLM18EG221SN1D
24	1	J2	Connector, Power Jack, 2.1 mm x 5.5 mm, 12 V, 4 A, Right Angle, TH	Cui Stack	PJ-002AH
25	1	J5	Connector, SD/MMC4.0, Normal Mount, SMT	Proconn	SDC013-A0-5002
26	1	J3	Receptacle, USB, Style B, Right Angle, Through-hole	FCI	61729-x0xxBLF
27	2	J4, J6	Receptacle, USB, Style A, Right Angle, Through-hole	AMP	292303-1
28	4	J7, J9, J10, J11	Header, 1 x 2, 0.1 Inch, Vertical	Samtec	TSW-102-14-L-S
29	1	J8	Header, 2 x 5, 0.1 Inch, Vertical	AMP	146256-5

TABLE C-1: EVB-USB2642 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number
30	2	TP5, TP12	Test Point, Yellow, Loop, Mini, 0.04 Inch ID	Samtec	5004
31	3	TP6, TP8, TP13	Test Point, Black, Loop, Mini, 0.04 Inch ID	AMP	5001
32	1	TP7	Test Point, Orange, Loop, Mini, 0.04 Inch ID	Keystone	5003
33	2	TP9, TP14	Test Point, White, Loop, Mini, 0.04 Inch ID	Keystone	5002
34	1	U1	IC, MIC37100-3.3WS, LDO Regulator, 3.3V, 1A, SOT223-3	Keystone	MIC37100-3.3WS
35	3	U2, U8, U9	IC, 74LVC1G14, Inverter, Schottky, DCK	Keystone	SN74LVC1G14DCKR
36	1	U3	IC, USB2642, Automotive USB 2.0 Hub/Card reader, QFN-48	Micrel	USB2642
37	1	U6	IC, Power Distribution Switch, Dual, 500 mA continuous, SO-8	TI	MIC2026-1BM
38	1	U7	IC, UCS81001, Automotive USB PrtPwr Controller, QFN28	SMSC	UCS81001AM
39	1	Y1	Crystal, 24.000MHz, 50ppm, 18pF, HC-49SMT	Micrel	HCM49-24.000MABJ-UT
40	4	- none	Foot, Silicone Rubber, Adhesive, Clear, Cylindrical, .500" x .250"	SMSC	RBS-6
41	1	- none	Serial Number Labels	Citizen America	
42	1	- none	Assembly Labels: "EVB-USB2642_B2"	Bumper Specialties	
43	1	PCB Fab	PCB, Crest (EVB-USB82642), Rev. B	SMSC	EVB-USB82642_B
44	1	Assembly	Assembly, Crest (EVB-USB2642), Rev. B2	SMSC	EVB-USB2642_B2
45	1	C2	Capacitor, 0.1uF, 10V, 10%, X5R, 0402	Murata Electronics	GRM155R71A104KA01D
46	4	C3, C8, C13, C34	Capacitor, 1000pF, 50V, 10%, X7R, 0402	Murata Electronics	GRM155R71H102KA01D
47	3	C5, C9, C22	Capacitor, 33pF, 50V, 5%, NPO, 0402	Murata Electronics	GRM1555C1H330JZ01D
48	1	C15	Capacitor, Low ESR, 100uF, 6.3VDC, 20%, Aluminum, Radial-SMT, 5mm x 5.8mm	United Chemi-Con	EMZA6R3ADA101ME61G
49	2	R13, R27, R57	Resistor, 10.0K, 1%, 1/16W, 0603	Rohm	MCR03EZHF1002
50	2	FB2, FB3	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata Electronics	BLM18EG221SN1D
51	1	FB4	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata Electronics	BLM18EG221SN1D
52	1	FB5	Ferrite Bead, 120 Ohm, 0.5A, 0.1DCR, 0603	Panasonic	EXC-3BP121H
53	1	D2	Diode, Shottky, B240A-13, 40V, 2.0A, KA, SMA	Diodes® Inc.	B240A-13
54	2	BR1, BR2	Diode, Bridge, Switching, 50V, 140mA,KCAC, SOT-143	Infineon Tech	BGX50A
55	2	L1, L2	Inductor, Common Mode Choke, DLP11SN900SL2, 0504	Murata Electronics	DLP11SN900SL2
56	6	TP1, TP2, TP3, TP4, TP10, TP11	Header, 1x1, 0.1 Inch, Vertical	Amp/Tyco	103185-1
57	1	J1	Header, 1x2, 0.1 Inch, Vertical	Samtec	TSW-102-14-L-S
58	1	U4	IC, 25x20, 2Mb (256K x 8) SPI Serial FLASH, 2.5V-3.3V, 75MHz, SO8	Numonyx	M25P20-VMN6P

TABLE C-1: EVB-USB2642 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number
59	1	U5	IC, Omega ID, 2 Wire Serial / SPI i/f, SO8		
60	1	U10	IC, 24C04, 2 Wire Serial EPROM, 4Kb, 2.7V, DFN-8	Microchip Technology Inc.	24LC04BT-I/MC
61	1	SHUNT1	Shunt, Insulated, 0.1 Inch	AMP	881545-2

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