EVB-USB2422 Evaluation Board User's Guide

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Preface

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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-USB2422 Evaluation Board User's Guide. 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

The manual layout is as follows:

- **Chapter 1. "EVB-USB2422 Board Overview"** – This shows a brief description of the EVB-USB2422 Evaluation Board.
- **Chapter 2. "Hardware Configuration"** – This shows information of the board hardware and its configuration.

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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- **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

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

Revisions	Section/Figure/Entry	Correction
DS50003564A (08-30-23)	Initial release	

Chapter 1. EVB-USB2422 Board Overview

1.1 INTRODUCTION

The USB2422 is a low-power, full-featured, configurable, Hi-Speed USB 2.0-compliant hub with two downstream ports. Each of the downstream ports in the USB2422 device is capable of supporting battery charging. The EVB-USB2422 Evaluation Board demonstrates a standalone application for the hub with all the features listed in the following section and demonstrates advanced power saving options and configurable port assignments.

1.2 FEATURES

- 24-pin QFN RoHS compliant package
- Two USB 2.0 downstream hub ports with individual port power and overcurrent sense (OCS)
- Hi-Speed (480 Mbps), Full-Speed (12 Mbps), and Low-Speed (1.5 Mbps) compatible
- USB battery charging
- Supports Single-TT configuration for Full-Speed and Low-Speed connections (when connected to a Hi-Speed host)
- Supports an internal default hub configuration or configuration from external SMBus
- Low-cost four-layer space-saving design with two outer signal layers and two inner ground layers
- Individual port power control with LEDs for port power indication
- Self-powered operation
- Operates from a single voltage (5.0 VDC, regulated) external power supply
- Single onboard 3.3 VDC regulator
- Yellow LED indicator for Suspend hub state (optional)
- EMI component footprints provided (optional)
- Onboard 24 MHz crystal and ceramic resonator driver
- Schematics, layout and bill of materials are available to minimize new product development time

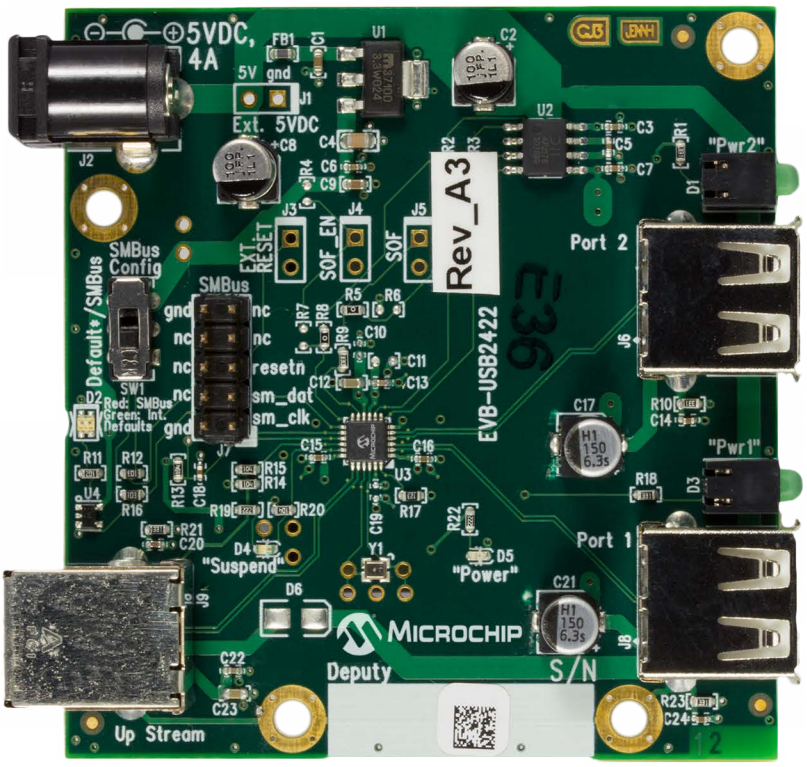
1.3 GENERAL DESCRIPTION

The EVB-USB2422 is an evaluation and demonstration platform featuring the USB2422 Ultra Fast USB 2.0 Hub on a four-layer RoHS compliant printed circuit board.

The EVB-USB2422 is designed to demonstrate the unique features of this device using a low-cost PCB implementation with individual port power control for the downstream USB 2.0 ports. The downstream USB 2.0 ports include a high-current port power controller, U2, to fully support USB battery charging as a high-current wake-up port.

The EVB-USB2422 is designed to support internal default configuration settings as well as an external SMBus interface (optional) for custom configured functionality. The external SMBus header, J7, is provided for configuration. Figure 2-1 and Figure 2-2 show the top-level and bottom-level silk screen and copper layers.

FIGURE 1-1: EVB-USB2422 EVALUATION BOARD



Chapter 2. Hardware Configuration

2.1 HARDWARE DESCRIPTION

The EVB-USB2422 has one onboard regulator that generates 3.3 VDC from an external 5 VDC regulated power supply. There is also an option to supply power externally through the J1 external 5 VDC power header (not populated by default). The USB2422 generates its own 1.2 VDC for internal use with on-chip 1.2 VDC regulators. The internal 1.2 VDC regulator to the oscillator and the PLL is turned off during Suspend mode to minimize suspend current. The USB2422 consumes power from the 3.3 VDC supply. The downstream port power is distributed by one high current port power switch, U2, that consumes power from the 5 VDC supply. All upstream and downstream port connectors have USB 2.0-compliant decoupling and a separate shield ground.

2.1.1 Port Assignment

Downstream ports are numbered 1 and 2 with one two-channel port power controller that individually supplies power to each downstream port. Overcurrent sensing is also monitored individually on each downstream port. Downstream port 1 is tied to the USB 2.0 connector, J8, and downstream port 2 is tied to the USB 2.0 connector, J6. The USB2422 allows any or all of the downstream ports to be configured for high current battery USB charging, as demonstrated by the EVB-USB2422.

2.1.2 USB2422 Configuration

Default: The EVB-USB2422 is set up to support an internal default configuration as determined by the state of the **CFG_SEL0** pin immediately after Reset. The vendor ID, product ID, language ID, device ID, and other options are set using ROM code defaults. In normal operation, SMBus is disabled by switching the SMBus Config switch, SW1, into the *Default** position. By switching SW1 into the Internal Defaults mode, **SM_CLK/CFG_SEL0** and **SM_DAT/NON_REM1** are pulled low to GND through the 10 kΩ resistors, R16 and R12, respectively. Additionally, the *Config* LED D2 will display green to indicate it is operating with internal defaults.

SMBus Option: The EVB-USB2422 can load configuration from an external SMBus interface through the onboard header, J7. To enable SMBus, SW1 must be switched to the *SMBus* position instead of *Default**. This sets the SMBus address to 0101100b. By switching SW1 into SMBus mode, the **SM_CLK/CFG_SEL0** and **SM_DAT/NON_REM1** signals are pulled high to 3.3 V through the 10 kΩ resistors, R16 and R12, respectively. Additionally, the *Config* LED D2 will display red to indicate it is operating in SMBus mode.

Once configured in the SMBus mode, battery charging may optionally be enabled on any of the downstream ports. The register memory map location 0xD0 is dedicated for Battery Charging support. Bit 1 enables battery charging for downstream port 1 and bit 2 enables battery charging for downstream port 2. Each port that has been enabled for battery charging will assert its corresponding **PRTPWR** pin. When the ports are configured for battery charging, the corresponding **PRTPWR** pin will be controlled by battery charging logic instead of the normal hub logic. PRTPWR will assert after initial hub configuration and will remain asserted and under the control of battery charging logic until one of two events occur:

- An overcurrent is detected on the corresponding **OCS_n** pin. In this case, **PRTPWR** will deassert,and the only way to re-enable the **PRTPWR** is to reset the part.
- The hub is connected on its upstream port and is enumerated by a USB host. In this case, control over **PRTPWR** reverts to the hub logic inside the part and the normal USB behavior applies, that is, the host must enable **PRTPWR**.

2.1.3 Powered State LED

An optional orange LED (D5) indicates when +3.3 VDC power is present.

2.1.4 Activity LED

An optional yellow LED (D4) indicates when the USB2422 is in suspend.

2.1.5 Port Power LEDs

The green LEDs, D1 and D3, indicate when port power is available to the associated downstream USB port. D1 represents port 2 power, and D3 represents port 1 power.

2.1.6 Connector Description

The EVB-USB2422 has a set of standard USB style connectors, one of type B for the upstream port and two of type A for the downstream ports. Power is supplied via a 2.1 mm power jack. Table 2-1 lists all of the connectors on the EVB. For more details on the pinout of these connectors, see the USB2422 schematics on the CD-ROM.

TABLE 2-1: CONNECTOR DESCRIPTION

Connector	Type	Description
J1	2x1	External +5 VDC
J2	Power Jack 2.1 mm	+5 VDC Power Supply
J3	2x1	External Reset
J6	USB A	Downstream USB Port 2
J7	2x5	SMBus Interface
J8	USB A	Downstream USB Port 1
J9	USB B	Upstream USB Port 0

2.1.7 Layout Considerations

The EVB-USB2422 is designed on four PCB layers, with two signal layers and two supply layers. The PCB layer stack-up is shown in Table 2-2. All signals are routed on the top and bottom layers. Internal layers are ground. Note that the differential signals from the USB2422 match the upstream and downstream port placement simplifying routing of critical signals. The total board thickness is 62 mil (±7 mil).

TABLE 2-2: PCB LAYER STACK

Component Side	
Solder mask	
Layer 1	0.5 oz. base, ~1 oz. finished
Pre-preg	1x1080 and 1x106 370HR (~4-4.6 mil)
Layer 2—GND	1 oz. base Cu
Core	~45 mil 370 HR
Layer 3—GND	1 oz. base Cu
Pre-preg	1x1080 and 1x106 370HR (~4-4.6 mil)
Layer 4	0.5 oz. base, ~1 oz. finished
Solder mask	

Component side top layer is shown in Figure 2-1 with silk screen information to identify component locations.

FIGURE 2-1: EVB-USB2422 TOP LAYER—COMPONENT SIDE

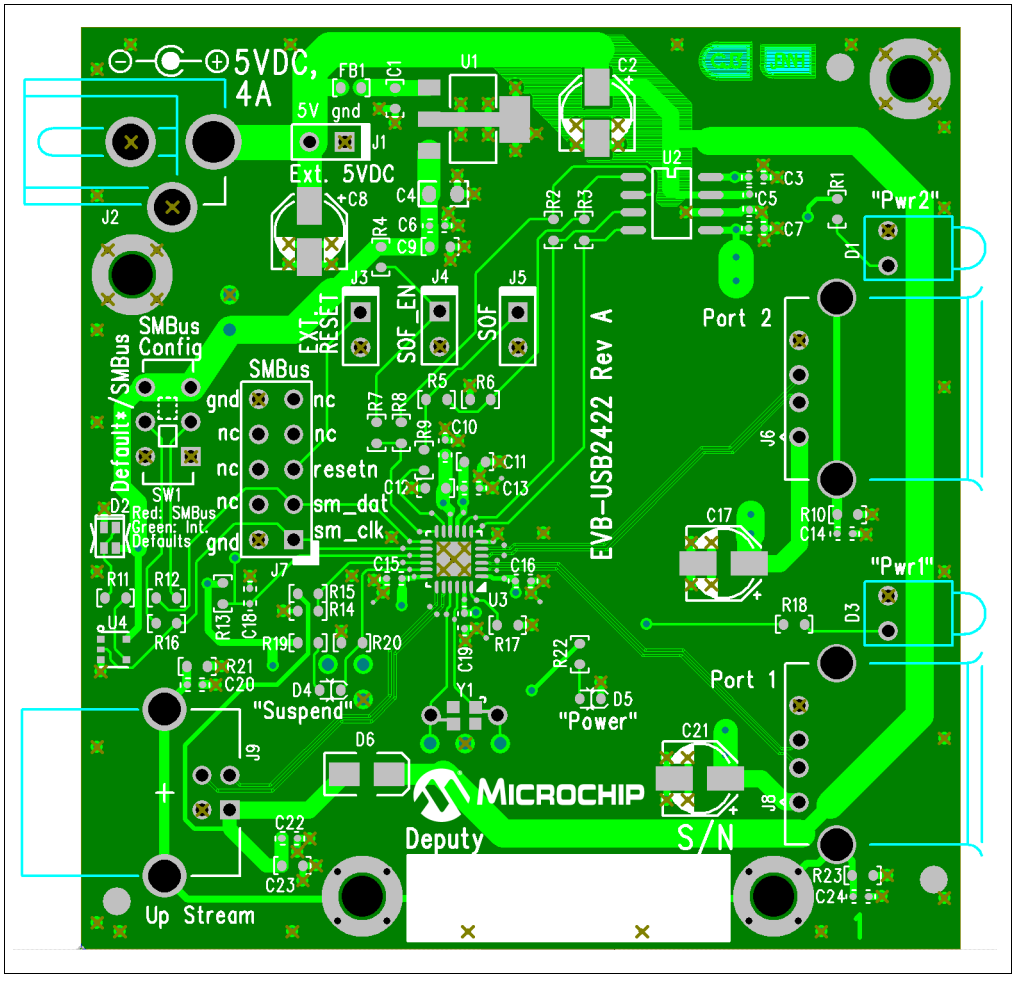
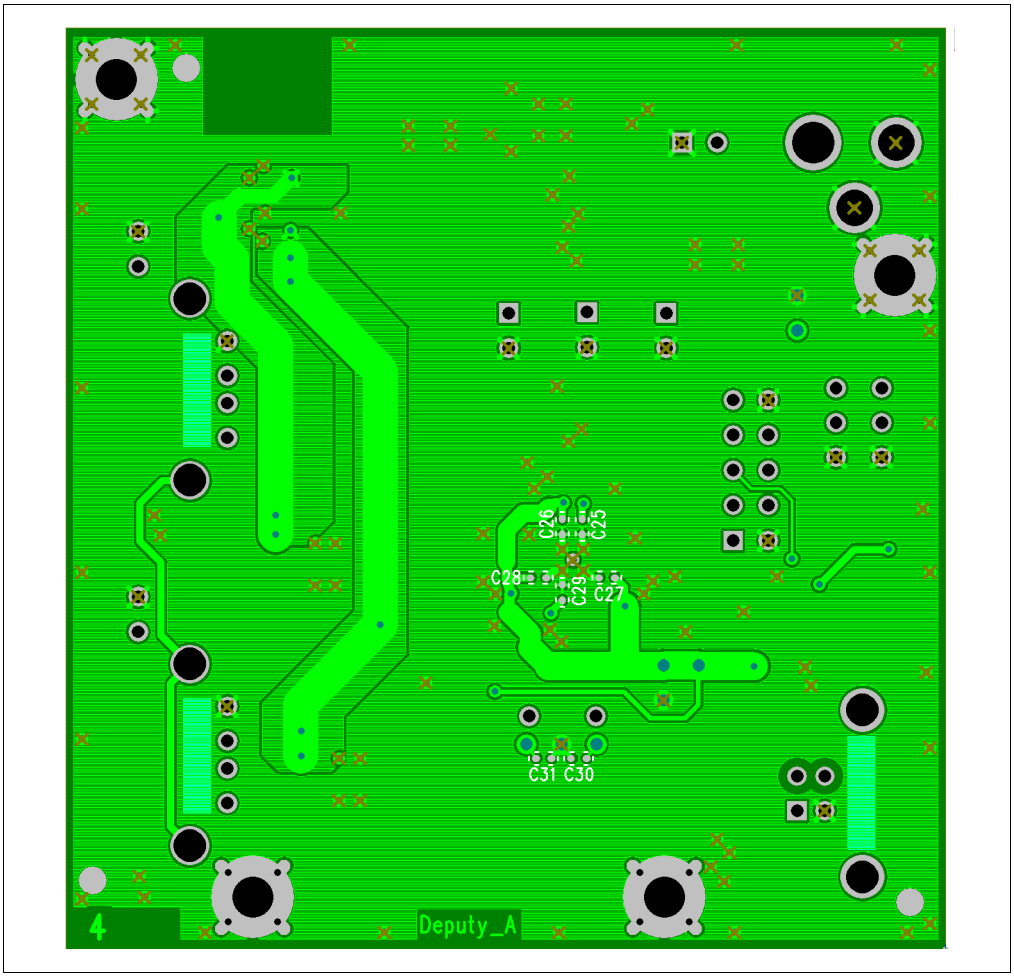


FIGURE 2-2: EVB-USB2422 BOTTOM LAYER—SOLDER SIDE



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