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ISBN: 9781620779842
Object of Declaration: EVB-USB4604 Evaluation Board User’s Guide

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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

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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-USB4604 Evaluation Board. Items discussed in this chapter include:

• Document Layout
• Conventions Used in this Guide
• Warranty Registration
• The Microchip Web Site
• Customer Support
• Document Revision History

DOCUMENT LAYOUT

This document describes how to use the EVB-USB4604 Evaluation Board as a demonstration platform optimized for portable applications. The manual layout is as follows:

• Chapter 1. “Overview” – Shows a brief description of the EVB-USB4604 Evaluation Board
• Chapter 2. “Hardware Configuration” – Includes information about the hardware configuration of the EVB-USB4604 Evaluation Board.
• Chapter 3. “EVB-USB4604 Operation” – Provides information about installing and operating the EVB-USB4604 Evaluation Board and Evaluation Software.
• Appendix A. “EVB-USB4604 Evaluation Board Schematic & BOM” – Provides the EVB-USB4604 schematic and Bill of Materials (BOM) information.
CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

<table>
<thead>
<tr>
<th>DOCUMENTATION CONVENTIONS</th>
<th>Description</th>
<th>Represents</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arial font:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italic characters</td>
<td>Referenced books</td>
<td><strong>MPLAB® IDE User’s Guide</strong></td>
<td>...is the only compiler...</td>
</tr>
<tr>
<td></td>
<td>Emphasized text</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial caps</td>
<td>A window</td>
<td>the Output window</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A dialog</td>
<td>the Settings dialog</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A menu selection</td>
<td>select Enable Programmer</td>
<td></td>
</tr>
<tr>
<td>Quotes</td>
<td>A field name in a window or dialog</td>
<td>“Save project before build”</td>
<td></td>
</tr>
<tr>
<td>Underlined, italic text with right angle bracket</td>
<td>A menu path</td>
<td><strong>File&gt;Save</strong></td>
<td></td>
</tr>
<tr>
<td>Bold characters</td>
<td>A device pin</td>
<td>Drive ID high</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A component on the board</td>
<td>Short J5 with a shunt jumper</td>
<td></td>
</tr>
<tr>
<td>N'Rnnnn</td>
<td>A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.</td>
<td>4'b0010, 2'hF1</td>
<td></td>
</tr>
<tr>
<td>Text in angle brackets &lt; &gt;</td>
<td>A key on the keyboard</td>
<td>Press &lt;Enter&gt;, &lt;F1&gt;</td>
<td></td>
</tr>
<tr>
<td>Courier New font:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plain Courier New</td>
<td>Sample source code</td>
<td>#define START</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filenames</td>
<td>autoexec.bat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>File paths</td>
<td>c:\mcc18\h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Keywords</td>
<td>_asm, _endasm, static</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Command-line options</td>
<td>-Opa+, -Opa-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit values</td>
<td>0, 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constants</td>
<td>0xFF, ‘A’</td>
<td></td>
</tr>
<tr>
<td>Italic Courier New</td>
<td>A variable argument</td>
<td>file.o, where file can be any valid filename</td>
<td></td>
</tr>
<tr>
<td>Square brackets []</td>
<td>Optional arguments</td>
<td>mcc18 [options] file [options]</td>
<td></td>
</tr>
<tr>
<td>Curly brackets and pipe character: {}</td>
<td>Choice of mutually exclusive arguments; an OR selection</td>
<td>errorlevel {0</td>
<td>1}</td>
</tr>
<tr>
<td>Ellipses...</td>
<td>Replaces repeated text</td>
<td>var_name [, var_name...]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Represents code supplied by user</td>
<td>void main (void) { ... }</td>
<td></td>
</tr>
</tbody>
</table>
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Please complete the enclosed Warranty Registration Card and mail it promptly. Sending the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

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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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- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the web site at:

http://www.microchip.com/support

http://www.microchip.com/USB4604

DOCUMENT REVISION HISTORY

REV A (March 2014)

- Initial Release of this Document.
Chapter 1. Overview

1.1 EVB-USB4604 Overview and Features

The USB4604 is an enhanced USB hub that provides additional features to differenti-ate a product from a traditional USB 2.0 hub. The USB4604 acts as a fully compliant 4-port USB 2.0 hub, but also enumerates an internal microprocessor for added functionality on the 5th hub endpoint. Through this 5th endpoint, the hub can act as a USB bridge to UART or I2C protocols. There are also USB commands to manually control the digital pins. Finally, the EVB-USB4604 is designed to utilize the USB4604 FlexConnect feature. This allows the hub to dynamically change which port is the upstream port. Refer to Section 1.2 “Features” for more information.

1.2 Features

- USB4604 in a 48-pin QFN RoHS compliant package
- One upstream USB or HSIC port
- Four USB 2.0 downstream ports with individual port power control and overcurrent sense (OCS)
- High-Speed (480 Mbps), Full-Speed (12 Mbps) and Low-Speed (1.5 Mbps) compatible on downstream USB ports
- Multi-Transaction Translator
- Supports internal default hub configuration. Optionally supports external configuration via I2C or SPI.
- OTP configuration available to change the default hub configuration
- Access headers for power, digital pins and USB ports 3 and 4
- Self-Powered operation
- On Board +5 VDC and +3.3 VDC regulators
- Single 24 MHz crystal clock source
- Designed to stack with custom boards for system prototyping
- Schematics, layout and bill of materials are available to minimize new product development time

1.3 General Description

The EVB-USB4604 is an evaluation and demonstration platform featuring the USB4604 USB 2.0 hub controller on an RoHS compliant Printed Circuit Board (PCB).

The EVB-USB4604 is designed to demonstrate the unique features of this device using a low-cost PCB implementation. The digital pins are exposed to rows of headers such that companion boards can be designed to complete the system prototyping.

The EVB-USB4604 can be used as a stand alone hub, as a FlexConnect enabled hub, or as part of a larger system. The default connectors for the upstream (FLEX) port and the downstream (SWAP) port 1 are uAB connectors to facilitate connecting to either a USB Host or a Device.

The EVB-USB4604 also contains features to communicate with the UCS81001. This smart port power switch can act as an SMBus/I2C slave to configure the current limit and read the current drawn on that particular port.
Chapter 2. Hardware Configuration

2.1 HARDWARE DESCRIPTION

2.1.1 Port Assignment

The USB4604 is a 4-port USB hub. The upstream port can be configured to either USB or HSIC. When the Hub is powered up, or when the RESET button is pressed, the USB lines will be sampled. If the USB lines are pulled up during a power up or reset operation (POR), the USB port will be disabled and the HSIC port will be enabled. SW4 on the EVB-USB4604 is used to pull the DP/DM pins on the upstream port, or Port 0.

FIGURE 2-1: UPSTREAM USB DISABLE SWITCH

2.1.2 USB4604 Configuration

The USB4604 is a flexible hub that is capable of being reconfigured to meet the needs of system designers. There are multiple ways that the USB4604 can be configured, with each method having their own advantages and disadvantages. The EVB-USB4604 allows three different configuration options, as detailed in the following sub-sections.

2.1.2.1 DEFAULT/OTP OPTION

By default, the EVB-USB4604 will load all configuration options from the device’s internal ROM. The USB4604 will load the default configuration and then apply any additional OTP commands that have been loaded through the ProTouch tool.

2.1.2.2 I²C/SMBUS OPTION

The USB4604 can also act as an SMBus slave. Systems that have an on-board microcontroller with I²C or SMBus Master control can customize the USB4604 via this interface. For more details on the capabilities of the SMBus slave interface, refer to Application Note 26-19, SMBus Slave Interface for the USB253x/USB3x13/USB46x4.
The EVB-USB4604 can enable and disable the SMBus slave interface via switch SW3. This will connect the SMBus pins to the pull-up resistors of the SMBus lines, or tie them to ground. The SMBus pins are sampled during POR, so the switch must be set before the board is powered up or the nRESET pin is driven low and then high again.

FIGURE 2-2: SMBUS ENABLE SWITCH

The SMBus lines also connect to the UCS81001 port power controllers to enable an SMBus master to communicate with all devices on the EVB-USB4604. The SMBus addresses are as follows:

<table>
<thead>
<tr>
<th>Device</th>
<th>SMBus Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB4604 (Configuration)</td>
<td>0101101b (2Dh)</td>
</tr>
<tr>
<td>USB4604 (Runtime)</td>
<td>0101100b (2Ch)</td>
</tr>
<tr>
<td>UCS Port 0</td>
<td>1010100b (54h)</td>
</tr>
<tr>
<td>UCS Port 1</td>
<td>0110000b (30h)</td>
</tr>
<tr>
<td>UCS Port 2</td>
<td>0110001b (31h)</td>
</tr>
<tr>
<td>UCS Port 3</td>
<td>0110010b (32h)</td>
</tr>
<tr>
<td>UCS Port 4</td>
<td>0110011b (33h)</td>
</tr>
</tbody>
</table>

The SMBus pins can be accessed on pins 1 and 3 of the J12 connector. The EVB-USB4604 has the SMBus pins pulled up to the on-board 3.3V regulator. If a different voltage is required, remove R11 and apply the pull-up resistance to pins 4 and 6 of J12. R13 and R15 are 10k Pull-Up resistors used for SMBus communication.

FIGURE 2-3: R11 AND SMBUS PINS
2.1.2.3 SPI OPTION

The USB4604 can also load firmware developed by Microchip to address specific applications, or load the product firmware of a specific part number. The USB4604-1050, USB4604-1080 and USB4604-1090 can all be loaded through the SPI Flash to evaluate each product with the same board.

The SPI flash can be programmed many more times than the OTP registers can, allowing more dynamic use of the EVB. To program the SPI Flash, ensure it is powered and use the ProTouch tool to load the custom firmware. Place a shunt jumper on J11 before powering on the USB4604 to load firmware from the SPI Flash. When the jumper is removed, the USB4604 will use the internal ROM and OTP settings.

FIGURE 2-4: SPI FLASH AND ENABLE JUMPER

2.1.3 Power Source

The EVB-USB4604 allows access to the VBAT and VDDCOREREG supply pins. To evaluate the current consumption in any particular application, external supplies can be used to supply power to just the USB4604. Headers J15 and J16 are used to access the power pins. Pin 1 of J15 is connected to the VDD33 regulator output of the USB4604, pin 2 of J15 is connected to VDDCOREREG. Pin 1 of J16 is connected to VBAT and pin 2 is connected to the boards 5V supply.

FIGURE 2-5: VBAT AND VDDCORE ACCESS
2.1.4 FlexConnect and Port Power Control

To use the FlexConnect feature, the following pins need to be routed to the correct control lines:

- **SUSP/PIO0** controls the FLEX or Port0 port power controller. When in the Flex state, the PIO0 pin will enable a pull-up to 3.3V and report an over current event on Downstream Port 1 if this is pulled low. Placing a shunt jumper on J4 makes this connection.

- **VBUS_DET** is used to tell the hub to enumerate. If this pin is low, the Hub will not attempt to communicate with the Host controller. J2 connects this pin to the VBUS of Port0 through a voltage divider.

- **PIO8** is used to drive the ID pin of the uAB connector on the EVB-USB4604. USB devices that support OTG use the ID pin to determine whether to act as the Host, or as a Device. In normal applications, the USB cable terminates the ID pin by shorting it to GND, or by floating the pin. The OTG port will then provide VBUS and act as a USB Host if ID is grounded, and it will act as a device if ID is floated. The EVB-USB4604 takes advantage of this signaling by routing the digital outputs of the USB4604 to the ID pins of the connector, allowing the USB4604 to manage the direction control. If the Host system would rather manage the direction control, the digital pins can be isolated. J3 connects this pin to the ID of Port0.

- **PRTPWR1** changes to the PRTCTL1 role. This controls the SWAP or Port1 power controller. When in the default state, the PRTCTL1 pin will pull-up to 3.3V and report an over current event on Downstream Port 1 if this pin is pulled low. Placing a shunt resistor on pins 1 and 2 of J9 will connect the ALERT# of the UCS81001 to register an over current event on the PRTCTL1 pin.

- **OCS1_N** will tell the hub to enumerate when in the Flex state. Placing a shunt resistor between pins 3 and 4 of J9 will connect this pin to the VBUS of Port1.

- **PIO10** is used to drive the ID pin of Port1. This pin functions similar to PIO8 only it will pull high in the default state, and drive low in the Flex state.

FIGURE 2-6: PIO PIN CONTROL

To implement FlexConnect with supported technology, uAB connectors are used on the FLEX and SWAP ports. These enable uA or uB cables to be used for static role reversal, or custom USB cables that pass the ID pin up to the other connector rather than terminating it internally.
2.1.5 Digital Pin Access

The USB4604 also has the ability to act as a USB bridge to control other components in a system. The USB2530 SDK allows the USB host to send SMBus/I2C or UART commands that can access other devices that don’t support the USB protocol. There are also pins that can be configured as general purpose digital pins (PIO) for static control. J12 and J13 provide access to the digital pins as well as access to the DP/DM pins of ports 3 and 4. These headers are designed to allow system designers to create cables or PCBs that can mate with the EVB-USB4604 to evaluate how the USB4604 will function in their system.
Because of the speed of the USB signals, branching of the DP/DM lines can affect the communication. It is necessary to change 0 Ohm resistors according to the following table:

**TABLE 2-2: USB PORT RESISTORS**

<table>
<thead>
<tr>
<th>Populate</th>
<th>Remove</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>R31, R41</td>
<td>R26, R40</td>
<td>Port 3 J22 Connector</td>
</tr>
<tr>
<td>R26, R40</td>
<td>R31, R41</td>
<td>Port 3 J12 Connector</td>
</tr>
<tr>
<td>R63, R64</td>
<td>R24, R25</td>
<td>Port 4 J22 Connector</td>
</tr>
<tr>
<td>R24, R25</td>
<td>R63, R64</td>
<td>Port 4 J12 Connector</td>
</tr>
</tbody>
</table>

### 2.1.6 Connectors

Table 2-3 provides a list of EVB-USB4604 LEDs, headers, and switches along with descriptions of their default usage.

**TABLE 2-3: HEADER, SWITCH AND LED LOCATIONS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>Top Left</td>
<td>12V Power barrel inserted into this connector.</td>
</tr>
<tr>
<td>J2</td>
<td>Top Middle</td>
<td>Connects VBUS_DET voltage divider to FLEX or Port0 VBUS.</td>
</tr>
<tr>
<td>J3</td>
<td>Top Middle</td>
<td>Connects PIO8 to the FLEX or Port0 uB connector’s ID.</td>
</tr>
<tr>
<td>J4</td>
<td>Top Middle</td>
<td>Connects PIO0 to the FLEX port power controller.</td>
</tr>
<tr>
<td>J5</td>
<td>Top Middle</td>
<td>Connects PIO10 to the SWAP or Port0 uB connector’s ID.</td>
</tr>
<tr>
<td>J6</td>
<td>Top Middle</td>
<td>Connects the ALERT# of the UCS81001 to the OCS2_N pin or the PRTPWR2 pin.</td>
</tr>
<tr>
<td>J7</td>
<td>Top Middle</td>
<td>Connects the ALERT# of the UCS81001 to the OCS3_N pin or the PRTPWR3 pin.</td>
</tr>
<tr>
<td>J8</td>
<td>Top Middle</td>
<td>Connects the ALERT# of the UCS81001 to the OCS4_N pin or the PRTPWR4 pin.</td>
</tr>
<tr>
<td>J9</td>
<td>Top Middle</td>
<td>Connects the ALERT# of the UCS81001 to the OCS1_N pin or the PRTPWR1 pin. Also connects the VBUS of the SWAP or Port1 connector to the OCS1_N voltage divider.</td>
</tr>
<tr>
<td>J10</td>
<td>Center</td>
<td>Upstream or FLEX HSIC STROBE U.FL connector.</td>
</tr>
<tr>
<td>J11</td>
<td>Center Right</td>
<td>Powers the SPI Flash when a shunt resistor is placed between the pins.</td>
</tr>
<tr>
<td>J12</td>
<td>Center Right</td>
<td>Breaks out the digital pins and Port3 and Port4 DP/DM pins to a header.</td>
</tr>
<tr>
<td>J13</td>
<td>Center Left</td>
<td>Breaks out the PIO8 and PIO10 pins as well as the 12V, 5V and 3.3V regulated supplies.</td>
</tr>
<tr>
<td>J14</td>
<td>Center</td>
<td>Upstream or FLEX HSIC DATA U.FL connector.</td>
</tr>
<tr>
<td>J15</td>
<td>Center</td>
<td>Connects the VDDCOREREG input of the USB4604 to the VDD33 output. Can also be used to inject an independent supply.</td>
</tr>
<tr>
<td>J16</td>
<td>Center</td>
<td>Connects the VBAT input of the USB4604 to the 5V board supply. Can also be used to inject an independent supply.</td>
</tr>
</tbody>
</table>
TABLE 2-3: HEADER, SWITCH AND LED LOCATIONS (CONTINUED)

<table>
<thead>
<tr>
<th>Component</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J17-J20</td>
<td>Center</td>
<td>These are the HSIC connectors for the downstream ports, this only applies to the USB4624 and should not be used with the USB4604.</td>
</tr>
<tr>
<td>J21</td>
<td>Bottom Left</td>
<td>The USB Standard B connector for Port0 or the FLEX port. This is not populated by default.</td>
</tr>
<tr>
<td>J22</td>
<td>Bottom Right</td>
<td>The stacked USB A connectors for ports 3 and 4.</td>
</tr>
<tr>
<td>J23</td>
<td>Bottom Center</td>
<td>The Standard A connector for Port1 or the SWAP port. This is not populated by default.</td>
</tr>
<tr>
<td>J24</td>
<td>Bottom Center</td>
<td>The Standard A connector for Port2.</td>
</tr>
<tr>
<td>J25</td>
<td>Bottom Left</td>
<td>The uAB connector for Port0 or the FLEX port.</td>
</tr>
<tr>
<td>J26</td>
<td>Bottom Center</td>
<td>The uAB connector for Port1 or the SWAP port.</td>
</tr>
<tr>
<td>LED1</td>
<td>Top Left</td>
<td>Indicator that the 5V regulator is functional and 5V is present in the system.</td>
</tr>
<tr>
<td>LED2</td>
<td>Top Center</td>
<td>Indicator that the 3.3V regulator is functional and 3.3V is present.</td>
</tr>
<tr>
<td>LED3-10</td>
<td>Top Right</td>
<td>When used with SW2 these LEDs reflect the state of the digital outputs of the USB4604.</td>
</tr>
<tr>
<td>LED11-15</td>
<td>Bottom</td>
<td>Indicates the status of the VBUS on the USB ports. When these are lit, then VBUS is present.</td>
</tr>
<tr>
<td>SW1</td>
<td>Top Center</td>
<td>Connects to the nRESET pin of the USB4604, press to assert nRESET low.</td>
</tr>
<tr>
<td>SW2</td>
<td>Top Center</td>
<td>Connects GPIO outputs from the USB4604 to the LED indicators. Used to evaluate the USB-GPIO bridging functionality.</td>
</tr>
<tr>
<td>SW3</td>
<td>Center Left</td>
<td>Connects the SMBus pins of the USB4604 to the SMBus lines on the rest of the board.</td>
</tr>
<tr>
<td>SW4</td>
<td>Center</td>
<td>Used to disable the upstream USB port for HSIC communication.</td>
</tr>
</tbody>
</table>
2.1.7 Block Diagram

A basic block diagram of the board is below:

FIGURE 2-9: BLOCK DIAGRAM OF THE EVB-USB4604

FIGURE 2-10: PCB TOP SILK SCREEN IMAGES
Chapter 3. EVB-USB4604 Operation

3.1 GETTING STARTED

3.1.1 Contents of EVB-USB4604 Kit

The EVB-USB4604 evaluation kit includes the EVB-USB4604 along with the following:

- 12V Power Supply
- USB A to uB cable
- Custom 5-wire USB ID pass through cable

3.1.2 Bringing up the EVB-USB4604 default version

The EVB-USB4604 comes with the USB4604-1080 installed by default. The following Jumpers need to be in place for the Hub to function correctly:

- J2 - VBUS_DET is required for the Hub to enumerate.
- J6-9 - Pins 2 and 3 need to be shorted to ensure that the OCS1 pin gets the ALERT signal from the UCS8100x.
- J15 - This connects the CORE input to the VDD33 regulator output.
- J16 - This connects the VBAT pin to the boards 5V supply.

All other jumpers should be left open to get the desired functionality from the hub.
When the 12V supply is connected to J1, the 5V LED will light up and so will all of the Port LEDs. Connect the Hub to a PC and confirm the PC detect the Hub. The PC will also find the USB2530 attached to the 5th port of the hub, this is the Hub Controller and the driver for this can be found with the Software Development Kit, or it is installed with ProTouch.

FIGURE 3-3: POWERED SYSTEM
3.1.3 Loading a new configuration

To evaluate a different version, the SPI Flash can be programmed with the configuration options. The ProTouch tool is used to program the SPI Flash. First install the jumper on J11 to power the SPI Flash on the board. The ProTouch tool and different OTP and SPI configuration files can be found on the USB4604 product page at www.microchip.com/usb4604.

The USB4604-1090 version has additional pin functionality that requires a different jumper configuration than the default USB4604-1080 version. To evaluate the USB4604-1090 version, the following jumpers need to be added:

- J3 - This connects PIO8 to the upstream ID pin. This becomes the FLEX_OUT pin.
- J4 - This connects PIO/SUSPEND to the upstream port power controller.
- J5 - This connects PIO10 to the downstream ID pin. This becomes the FLEX_OUT_N pin.
- J11 - This powers the SPI Flash for temporary evaluation.
- Pin 1 and 2 of J9 - This ties PRTPWR1 to the ALERT pin of the port power controller.
- Pin 3 and 4 of J9 - This ties OCS1 to the VBUS on the downstream port.

FIGURE 3-4: USB4604-1090 JUMPER CONFIGURATION

Once the jumpers have been populated, use the ProTouch tool to load the USB4604-1090 configuration file found on the product page.

3.2 BOARD OPERATION

The EVB-USB4604 will operate as a standard hub by default. Ensure that SW3 is set to the DIS position to disable the SMBus control. The LEDs for the Port VBUS will all be active because the UCS81001 will generate 5V with a small amount of current for dead battery support. Once the VBUS is loaded, the VBUS will either stay on if PRTPWR is high, or drop if PRTPWR is low.
3.2.1 OTP and SPI Customization

When the hub is enumerated to a PC, the ProTouch tool can be used to customize the behavior and new configurations can be loaded. The ProTouch tool can load configuration files into the OTP space or the SPI Flash that is populated on the board. Be aware that each OTP register can only be programmed once, so every configuration file loaded through this method will decrease the amount of remaining OTP space. Once all the OTP registers have been written to, the part can no longer be configured through OTP.

The SPI Flash must be powered on in order to program to and load firmware from the SPI flash. Ensure that the proper jumpers are in place and the right supplies are present on the board before attempting to program.

3.2.2 Hub Controller

The hub will also enumerate with the USB2530 Hub Controller. This enables the SMBus/I²C, UART and GPIO control from the USB Host. The USB2530 SDK provides the necessary drivers and documentation on how to implement these commands. The SDK can be found on the USB4604 product page.

3.3 EVALUATING DIFFERENT PART NUMBERS

The EVB-USB4604 ships with the USB4604-1080 firmware installed. To evaluate the other versions of the USB4604 there are two options.

3.3.1 OTP

To load a different version through OTP:

- Locate the OTP file on the EVB website or your local FAE
- Use the ProTouch tool to program the OTP space. (www.microchip.com/protouch)

More details on the procedure can be found in the ProTouch documentation. This will permanently change the USB4604 installed on the board.

3.3.2 SPI

To load a version temporarily through SPI:

- Locate the desired version SPI binary file through your FAE or the EVB website.
- Short the headers on J11 to power the on-board SPI Flash.
- Connect the EVB-USB4604 to a Windows Host.
- Use the ProTouch tool (www.microchip.com/protouch) to program the Flash.
- Power cycle the EVB-USB4604 and the new configuration will be loaded.

The procedure can be repeated multiple times and will not change the default part installed on the board.

3.4 FLEXCONNECT

There are three ways to implement FlexConnect on this EVB.

3.4.1 SMBus Method

The SMBus method of implementing FlexConnect requires that the SMBus pins be connected to the on-board bus through SW3, these pins must be sampled high during POR. The SMBus pins can be access through J12 and the pull up voltage is set to the on board 3.3V by default. Refer to the FlexConnect application note and SMBus Slave application note for more details on implementing FlexConnect through this method.
3.4.2 GPIO Control

PIO3 is used to control the FlexConnect state. This can be accessed on J12. The pin has an internal pull down resistor to prevent this from being sampled incorrectly when the pin is left floating. To change the Flex state, drive the pin high or low. When the pin is high, Port1 or the SWAP port will be the upstream port and OCS1_N will look for VBUS. When OCS1_N is sampled high, the USB4604 will enable the pull up on the SWAP DP pin and wait for a host to initiate enumeration.

3.4.3 USB Packet Control

When using the USB packet, all control of the Hub is lost by the Host once the Flex command is sent. The digital outputs of PIO8 and PIO10 can be connected to the uAB connectors on Port0 and Port1 to take advantage of the OTG hardware control over the direction. Otherwise, the ports will switch and Port0 will enable the 15k pull down resistors as it is now a Downstream Port, or Host. Port1 will wait for OCS1_N to be high, then enable the pull up on DP.

3.5 FREQUENTLY ASKED QUESTIONS

3.5.1 Why are the Port Power LEDs always on?

The port power LEDs reflect the state of VBUS on each port. There are two cases where the LED would be lit even if the Hub has not enumerated with a USB host. The first case is that the UCS used on the evaluation board provides a low current voltage on the VBUS pin to detect if a device is attached or not. If any load is attached the VBUS voltage would drop to 0V. The second reason is that the USB4604 has been configured with battery charging enabled. That means that the USB4604 has been configured with battery charging enabled. That means that the Hub can charge devices, even without a USB host to control it.

3.5.2 Why doesn’t the Hub enumerate?

The EVB-USB4604 enables the user to evaluate every feature of the USB4604. Because there are some configurations that require an external processor to configure the hub prior to enumerating, the user should confirm that the settings chosen do provide for the hub to enumerate on its own. If the hub is configured in such a way that it should enumerate immediately, then the following items should be checked to verify that the EVB is functioning properly:

- Check J15 and J16 voltage levels and confirm that power is actually getting to the USB4604. Also, if pin 1 of J15 is at ~3.3V, then the part is at least in a powered state.
- Check C14 for 1.2V
- Check R23, if this is 1.2V, then the USB4604 is in an active state, either connected to a Host or in SMBus Configuration mode. If it is 0V the Hub could be in a suspended state if C14 is 1.2V
- Check SW3, if the switch is in the ENA position then the Hub is waiting for a SMBus master to send it commands.
- Check SW4, if the switches are toward the HSIC part of the silkscreen, then the upstream USB ports are disabled and the Hub is looking for a HSIC Host.
- Check J2, if VBUS_DET is not high, then the Hub will not try to enumerate.
Appendix A. EVB-USB4604 Evaluation Board Schematic & BOM

A.1 INTRODUCTION

This appendix shows the EVB-USB4604 Evaluation Board Schematic and Bill of Materials (BOM).
FIGURE A-2: EVB-USB4604 EVALUATION BOARD SCHEMATIC: PORT POWER CONTROLLERS
FIGURE A-3: EVB-USB4604 EVALUATION BOARD SCHEMATIC: DIGITAL IO AND POWER
<table>
<thead>
<tr>
<th>ITEM #</th>
<th>Quantity</th>
<th>Part Reference</th>
<th>Description</th>
<th>Digkey_Number</th>
<th>Manuf</th>
<th>Manuf_PN</th>
<th>DNP</th>
<th>SOM_Comments</th>
</tr>
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<tbody>
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<td>1 C07 C8 C10 C11 C12 C17 C18 C19 C20</td>
<td>111</td>
<td>C21</td>
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<td>7</td>
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<td>493-3051-2N</td>
<td>NICHICON</td>
<td>PCG0151MC1GS</td>
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<td>1 F1</td>
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<tr>
<td>11 J1</td>
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<td>J1</td>
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<td>12 J2 J14 J5 J15 J16</td>
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<td>HEADER, 1 x 2, 0.1 INCH, VERTICAL</td>
<td>WM6402-ND</td>
<td>MOLEX</td>
<td>22-28-4220</td>
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<td></td>
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<td>14 J6 J7 J8</td>
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<td>J6</td>
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<td>WM6403-ND</td>
<td>MOLEX</td>
<td>22-28-4220</td>
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<td>15 J9</td>
<td>15</td>
<td>J9</td>
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<td>WM6504-ND</td>
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<td></td>
</tr>
<tr>
<td>6 J10 J14 J17 J18 J19 J20</td>
<td>6</td>
<td>J10</td>
<td>CONNECTOR ULTRA MINI COAX SM</td>
<td>HS9161C-ND</td>
<td>HIROSE</td>
<td>J FL-R-SMT(10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 J2 J23 J13</td>
<td>10</td>
<td>J3</td>
<td>CONN HDR 100 20POS VERT</td>
<td>A4A288-15-ND</td>
<td>TE CONNECTIVITY</td>
<td>3-34263-1-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 J12</td>
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<td>TYCO ELECTRONICS</td>
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</tbody>
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If Hirose part not available Sub DK to use DX4R205J&JAR1800 or WM17143CT-ND