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**EVB-USB4604
Evaluation Board
User's Guide**

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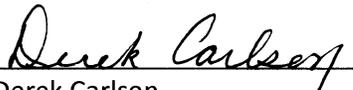
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VP Development Tools

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.

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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:

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><i>File>Save</i></u>
Bold characters	A device pin	Drive ID high
	A component on the board	Short J5 with a shunt jumper
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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- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the web site at:

- <http://www.microchip.com/support>
- <http://www.microchip.com/USB4604>

DOCUMENT REVISION HISTORY

REV A (March 2014)

- Initial Release of this Document.

NOTES:

Chapter 1. Overview

1.1 EVB-USB4604 OVERVIEW AND FEATURES

The USB4604 is an enhanced USB hub that provides additional features to differentiate 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).

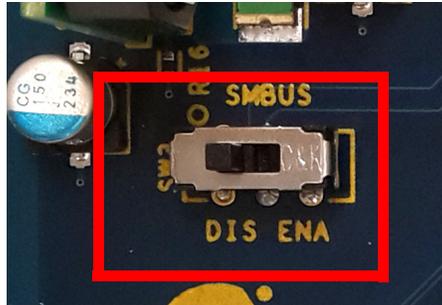
The EVB-USB4604 is designed to demonstrate the unique features of this device using a low-cost PCB implementation. The digital pins are exposed to rows of headers such that companion boards can be designed to complete the system prototyping.

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.

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



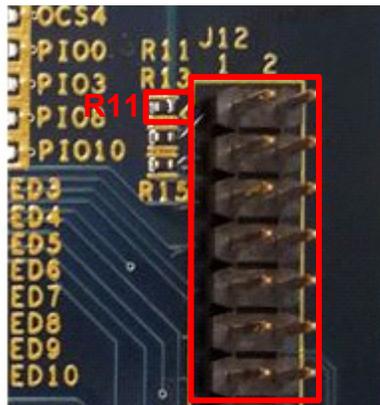
The SMBus lines also connect to the UCS81001 port power controllers to enable an SMBus master to communicate with all devices on the EVB-USB4604. The SMBus addresses are as follows:

TABLE 2-1: SMBUS ADDRESSES

Device	SMBus Address
USB4604 (Configuration)	0101101b (2Dh)
USB4604 (Runtime)	0101100b (2Ch)
UCS Port 0	1010100b (54h)
UCS Port 1	0110000b (30h)
UCS Port 2	0110001b (31h)
UCS Port 3	0110010b (32h)
UCS Port 4	0110011b (33h)

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

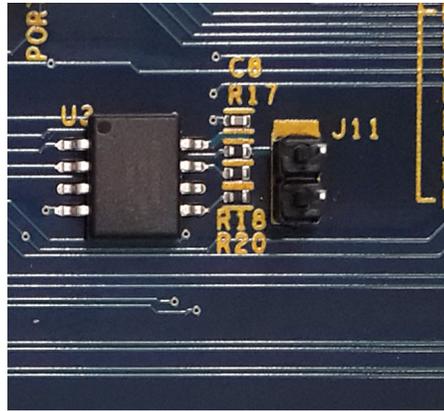


2.1.2.3 SPI OPTION

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.

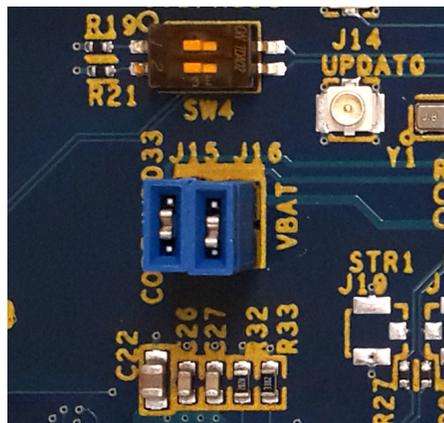
FIGURE 2-4: SPI FLASH AND ENABLE JUMPER



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

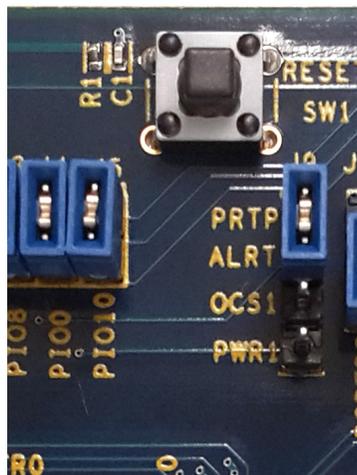


2.1.4 FlexConnect and Port Power Control

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

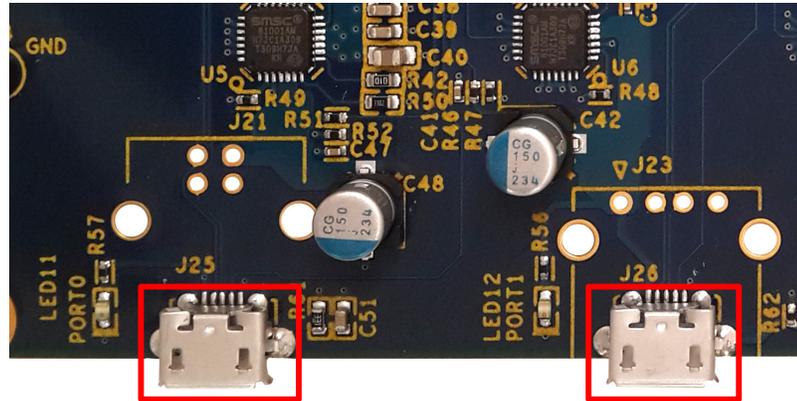
- **SUSP/PIO0** controls the **FLEX** or Port0 port power controller. When in the Flex state, the **PIO0** pin will enable a pull-up to 3.3V and report an over current event on Downstream Port 1 if this is pulled low. Placing a shunt jumper on **J4** makes this connection.
- **VBUS_DET** is used to tell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

FIGURE 2-7: USB CONNECTORS FOR FLEXCONNECT



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.

FIGURE 2-8: SYSTEM ACCESS HEADERS



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

Populate	Remove	Destination
R31, R41	R26, R40	Port 3 J22 Connector
R26, R40	R31, R41	Port 3 J12 Connector
R63, R64	R24, R25	Port 4 J22 Connector
R24, R25	R63, R64	Port 4 J12 Connector

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

Component	Location	Description
J1	Top Left	12V Power barrel inserted into this connector.
J2	Top Middle	Connects VBUS_DET voltage divider to FLEX or Port0 VBUS.
J3	Top Middle	Connects PIO8 to the FLEX or Port0 uB connector's ID.
J4	Top Middle	Connects PIO0 to the FLEX port power controller.
J5	Top Middle	Connects PIO10 to the SWAP or Port0 uB connector's ID.
J6	Top Middle	Connects the ALERT# of the UCS81001 to the OCS2_N pin or the P RTPWR2 pin.
J7	Top Middle	Connects the ALERT# of the UCS81001 to the OCS3_N pin or the P RTPWR3 pin.
J8	Top Middle	Connects the ALERT# of the UCS81001 to the OCS4_N pin or the P RTPWR4 pin.
J9	Top Middle	Connects the ALERT# of the UCS81001 to the OCS1_N pin or the P RTPWR1 pin. Also connects the VBUS of the SWAP or Port1 connector to the OCS1_N voltage divider.
J10	Center	Upstream or FLEX HSIC STROBE U.FL connector.
J11	Center Right	Powers the SPI Flash when a shunt resistor is placed between the pins.
J12	Center Right	Breaks out the digital pins and Port3 and Port4 DP/DM pins to a header.
J13	Center Left	Breaks out the PIO8 and PIO10 pins as well as the 12V, 5V and 3.3V regulated supplies.
J14	Center	Upstream or FLEX HSIC DATA U.FL connector.
J15	Center	Connects the VDDCOREREG input of the USB4604 to the VDD33 output. Can also be used to inject an independent supply.
J16	Center	Connects the VBAT input of the USB4604 to the 5V board supply. Can also be used to inject an independent supply.

Hardware Configuration

TABLE 2-3: HEADER, SWITCH AND LED LOCATIONS (CONTINUED)

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

2.1.7 Block Diagram

A basic block diagram of the board is below:

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

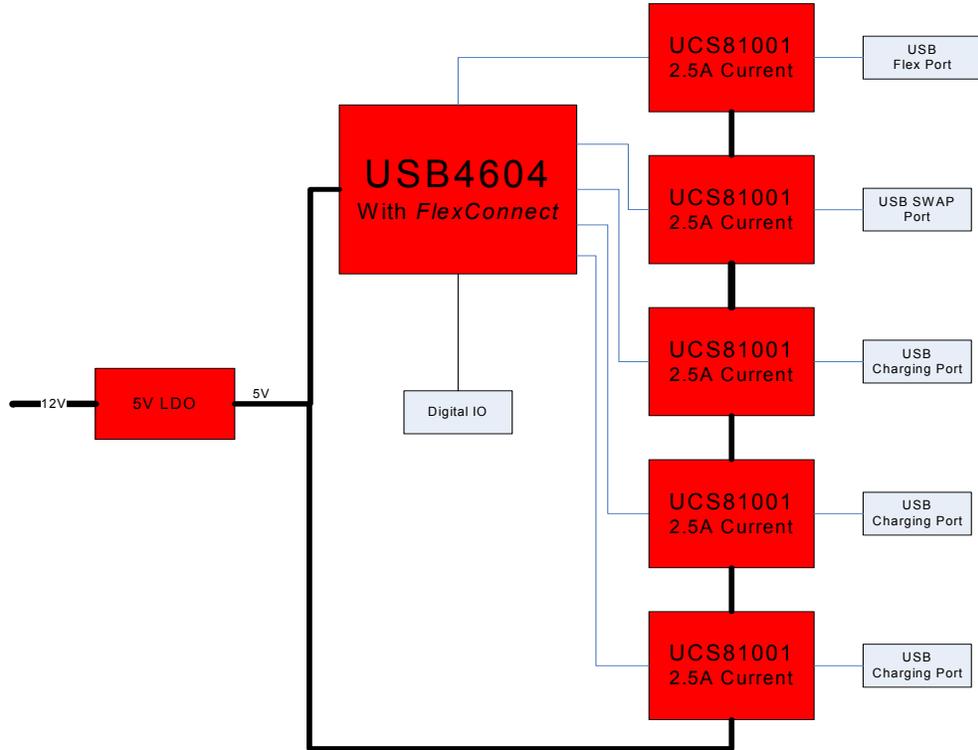
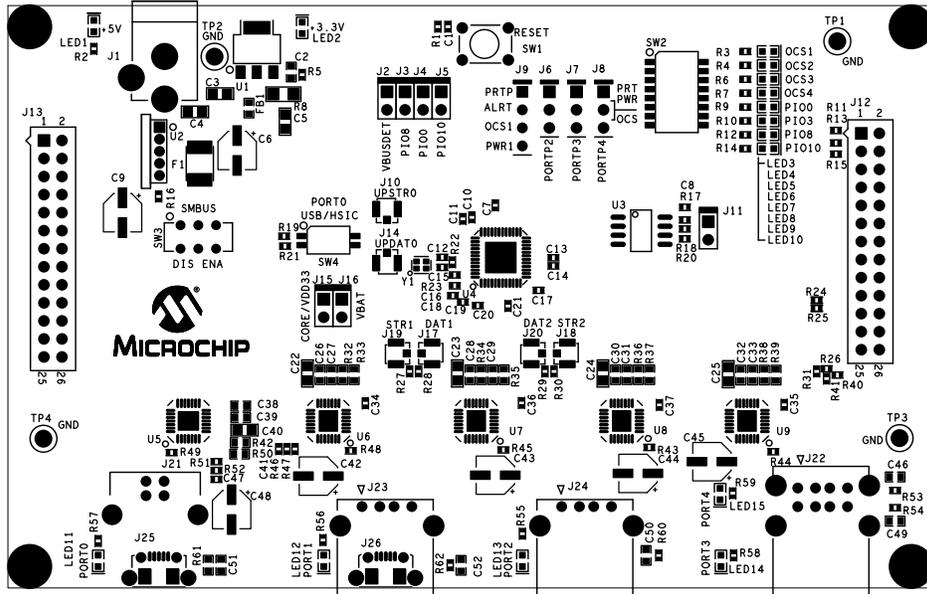


FIGURE 2-10: PCB TOP SILK SCREEN IMAGES



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

FIGURE 3-1: EVALUATION KIT CONTENTS



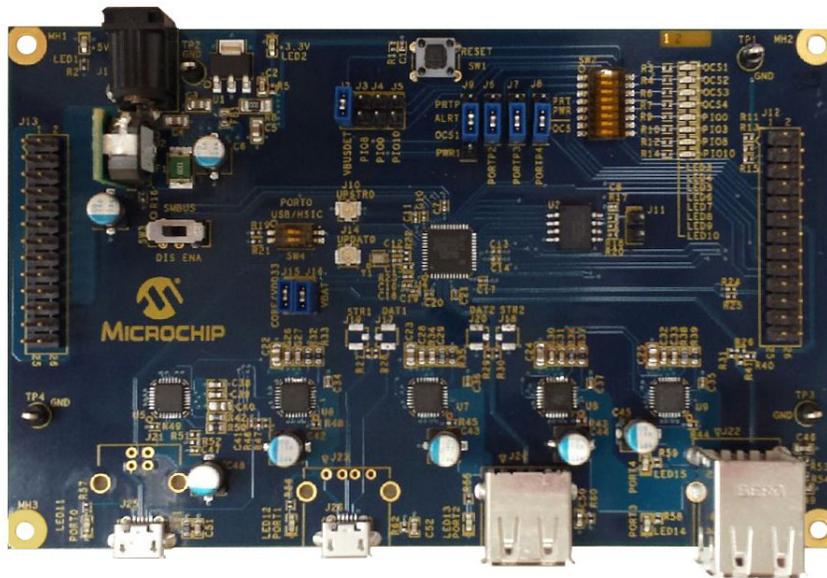
3.1.2 Bringing up the EVB-USB4604 default version

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.

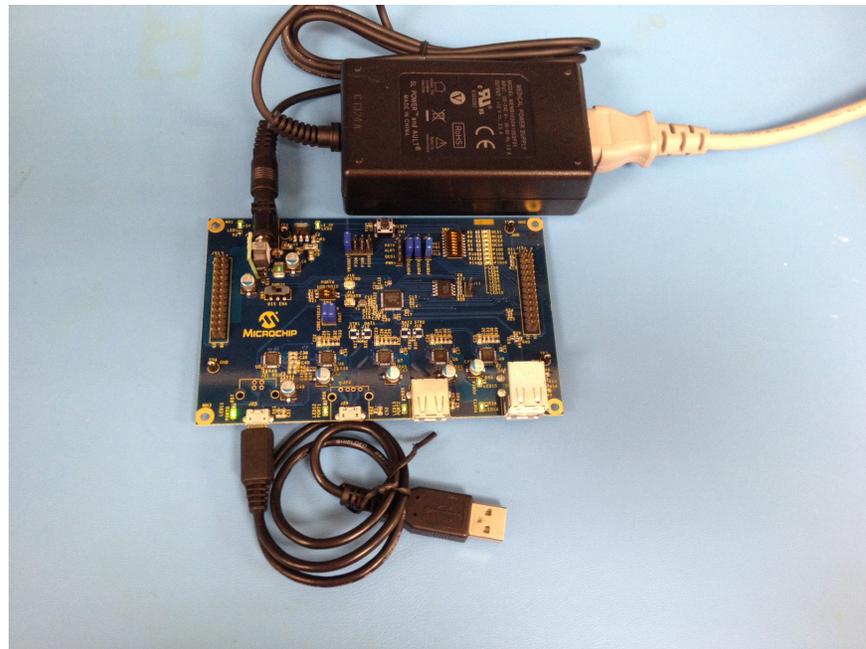
All other jumpers should be left open to get the desired functionality from the hub.

FIGURE 3-2: USB4604-1080 JUMPER CONFIGURATION



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 PIO0/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 PRT-PWR1 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 PRT-PWR is high, or drop if PRT-PWR 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 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.



EVB-USB4604 EVALUATION BOARD USER'S GUIDE

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-1: EVB-USB4604 EVALUATION BOARD SCHEMATIC: USB4604

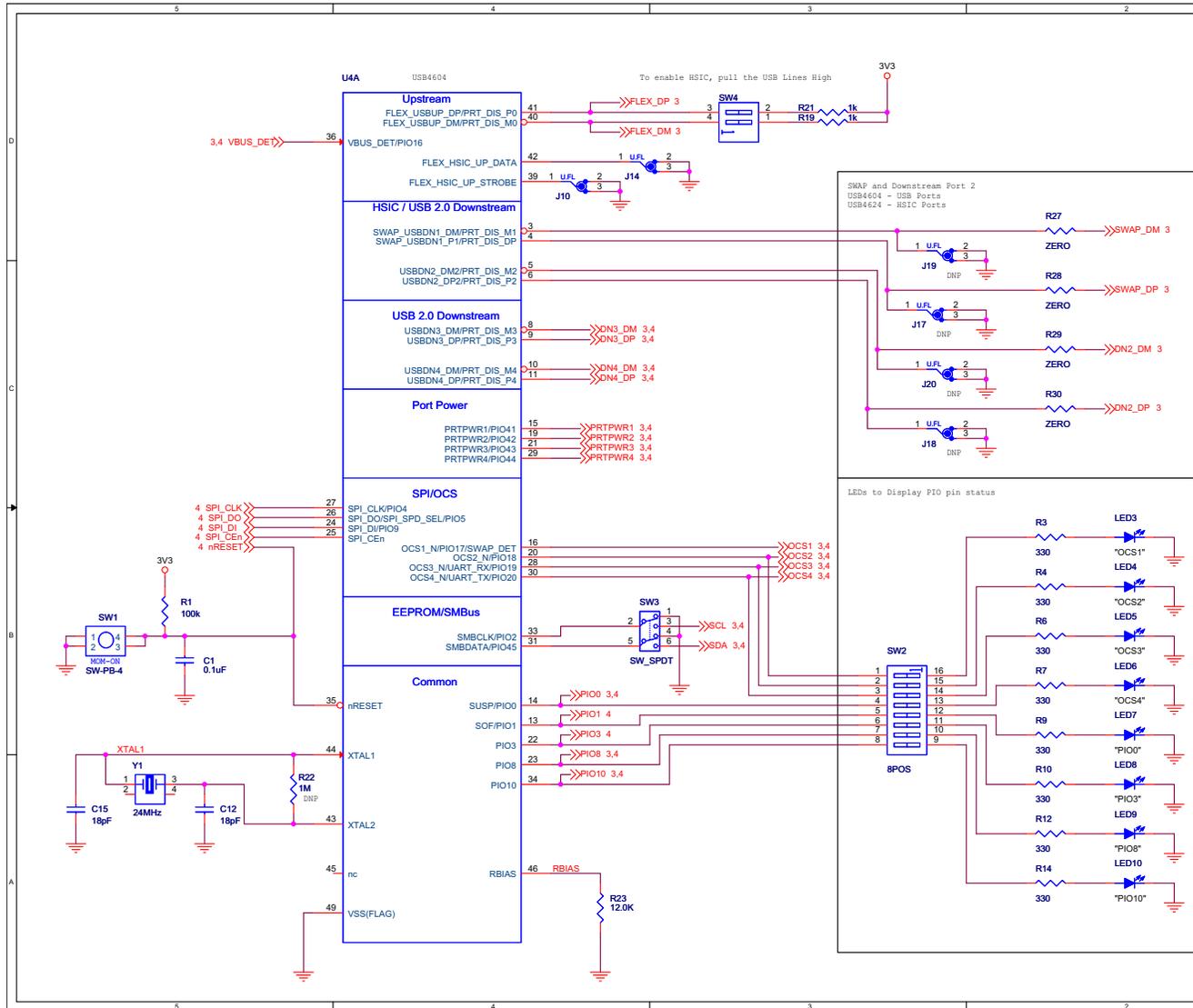


FIGURE A-2: EVB-USB4604 EVALUATION BOARD SCHEMATIC: PORT POWER CONTROLLERS

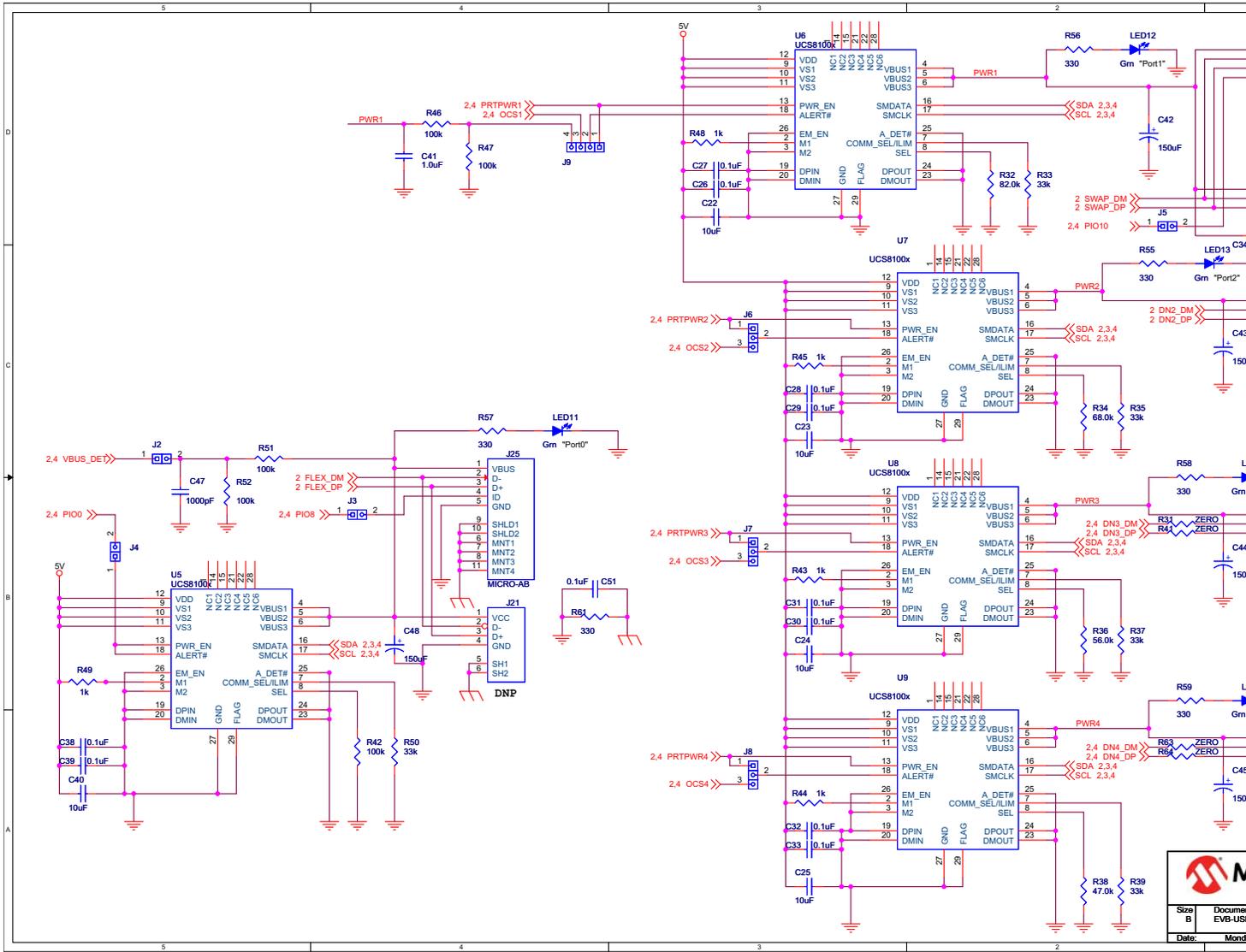


FIGURE A-3: EVB-USB4604 EVALUATION BOARD SCHEMATIC: DIGITAL IO AND POWER

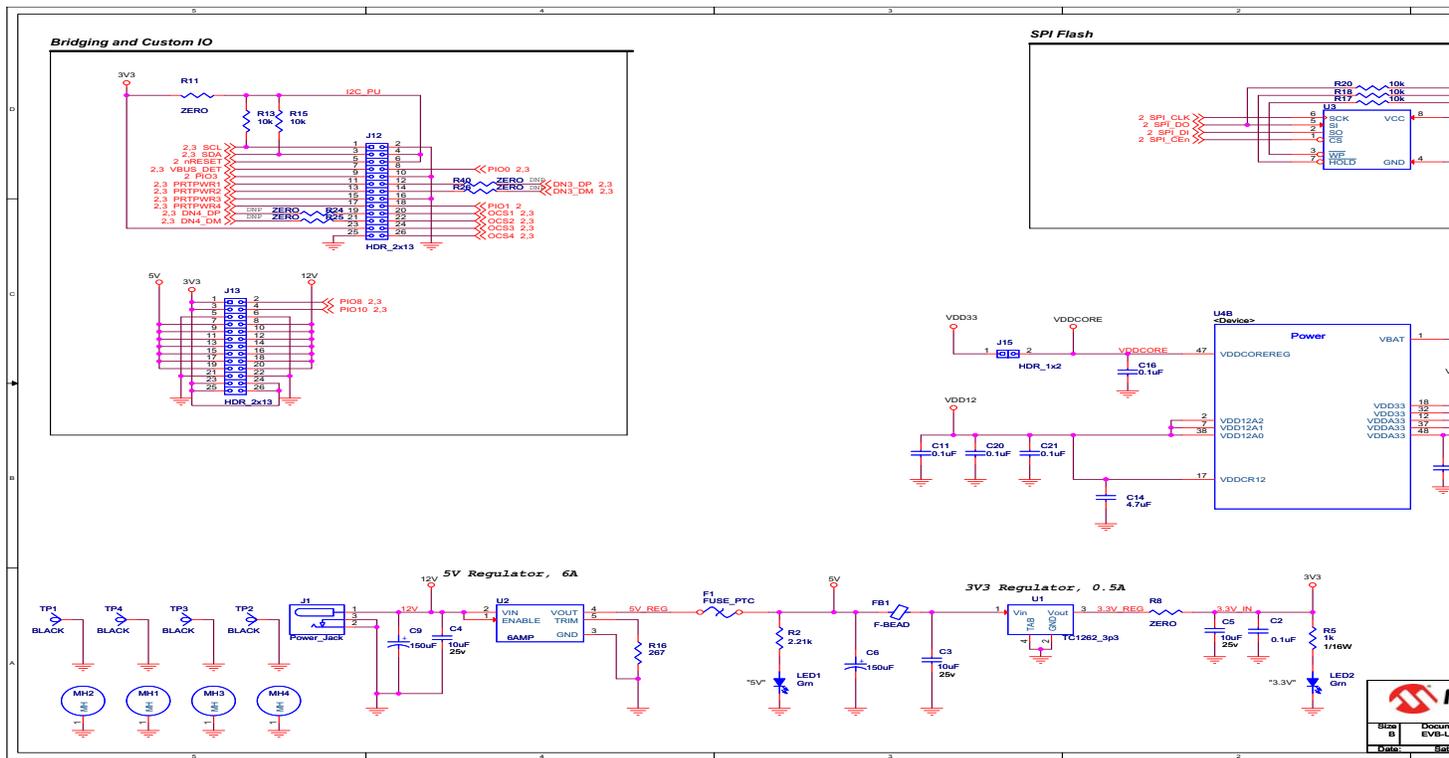


FIGURE A-4: BILL OF MATERIALS

ITEM #	Quantity	Part Reference	Description	Digikey_Number	Manuf	Manuf_PN	DNP
1	11	C1 C7 C8 C10 C11 C16 C17 C18 C19 C20 C21	CAPACITOR CERAMIC 0.1UF 10V X5R 0402	PCC2146CT-ND	PANASONIC	ECJ-0EB1A104K	
2	16	C2 C26 C27 C28 C29 C30 C31 C32 C33 C38 C39 C46 C49 C50 C51 C52	CAPACITOR CERAMIC 0.1UF 25V X7R 0603	PCC2277CT-ND	PANASONIC	ECJ-1VB1E104K	
3	3	C3 C4 C5	CAP CER 10UF 25V X5R 0805	490-5523-1-ND	MURATA ELECTRONICS	GRM21BR61E106KA73L	
4	7	C6 C9 C42 C43 C44 C45 C48	CAP ALUM 150UF 6.3V 20% SMD	493-3082-1-ND	NICHICON	PCGO1151MCL1G5	
5	2	C12 C15	CAPACITOR CERAMIC 18PF 50V 0402 SMD	PCC180CQCT-ND	PANASONIC	ECJ-0EC1H180J	
6	2	C13 C14	CAP CER 4.7UF 6.3V X5R 0402	490-5408-1-ND	MURATA ELECTRONICS	GRM155R60J475ME87D	
7	5	C22 C23 C24 C25 C40	CAP CER 10UF 16V X5R 0805	490-3886-1-ND	MURATA ELECTRONICS	GRM21BR61C106KE15L	
8	5	C34 C35 C36 C37 C47	CAPACITOR CERAMIC 1000PF 25V 0402	PCC102BQCT-ND	PANASONIC	ECJ-0EB1E102K	
9	1	C41	CAPACITOR CERAMIC 1.0UF 6.3V 20% X5R 040	490-1319-1-ND	MURATA ERIE	GRM155R60J105ME19D	
10	1	F1	PTC RESETTABLE SMD 1812 6V 3.0A	283-3166-1-ND	COOPER BUSSMANN	PTS18126V300	
11	1	FB1	FILTER CHIP 220 OHM 2A 0603	490-3992-1-ND	MURATA ELECTRONICS	BLM18EG2215N1D	
12	1	J1	CONN PWR JACK 2.5X5.5MM HIGH CUR 12V	CP-002BH-ND	CUI STACK	PJ-002BH	
13	7	J2 J3 J4 J5 J11 J15 J16	HEADER, 1 X 2, 0.1 INCH, VERTICAL	WM6402-ND	MOLEX	22-28-4020	
14	3	J6 J7 J8	HEADER, 1 X 3, 0.1 INCH, VERTICAL	WM6403-ND	MOLEX	22-28-4030	
15	1	J9	HEADER, 1 X 4, 0.1 INCH, VERTICAL	WM6404-ND	MOLEX	22-28-4040	
16	6	J10 J14 J17 J18 J19 J20	CONN RECEPT ULTRA-MINI COAX SMD	H9161CT-ND	HIROSE	U.FL-R-SMT(10)	J17 J18 J19 J20
17	2	J12 J13	CONN HDR BRKWAY .100 26POS VERT	A34268-13-ND	TE CONNECTIVITY	9-146261-0-13	
18	1	J21	RECEPTACLE, USB, STYLE B, RIGHT ANGLE	A31725-ND	TYCO ELECTRONICS	292304-1	J21
19	1	J22	RECEPTACLE, USB, STYLE A, STACKED	609-1040-ND	FCI	72309-8034BLF	
20	2	J23 J24	RECEPTACLE, USB, STYLE A, RIGHT ANGLE	609-1045-ND	FCI	87520-0010BLF	J23
21	2	J25 J26	CONNECTOR RECEPT MICRO USB TYPE AB SMT	H11611CT-ND	HIROSE	ZX62RD-AB-5P8	If Hirose p use DX4R2 ND
22	7	LED1 LED2 LED11 LED12 LED13 LED14 LED15	LED GREEN SMT	404-1005-1-ND	STANLEY	BG1111C-TR	
23	8	LED3 LED4 LED5 LED6 LED7 LED8 LED9 LED10	LED BLUE RECT CLEAR 0603	160-1837-1-ND	LITEON	LTST-C194TBKT	
24	5	R1 R46 R47 R51 R52	RESISTOR 100K OHM 1/10W 5% 0402 SMD	P100KJCT-ND	PANASONIC	ERJ-2GEJ104X	
25	1	R2	RESISTOR 2.21K OHM 1/10W 1% 0402 SMD	P2.21KJCT-ND	PANASONIC	ERJ-2RFK2211X	
26	17	R3 R4 R6 R7 R9 R10 R12 R14 R53 R54 R55 R56 R57 R58 R59 R60 R62	RESISTOR 330 OHM 1/16W 1% 0402 SMD	311-330LRCT-ND	YAGEO	RC0402FR-07330RL	
27	8	R5 R19 R21 R43 R44 R45 R48 R49	RESISTOR 1.0K OHM 1/16W 5% 0402 SMD	P1.0KJCT-ND	PANASONIC	ERJ-2GEJ102X	
28	1	R8	RESISTOR ZERO OHM 1/4W 5% 1206	311-0.0ERCT-ND	YAGEO	RC1206JR-070RL	
29	13	R11 R24 R25 R26 R27 R28 R29 R30 R31 R40 R41 R63 R64	RESISTOR ZERO OHM 1/16W 5% 0402 SMD	311-0.0JRCT-ND	YAGEO	RC0402JR-070RL	R24 R25 R26 R40
30	5	R13 R15 R17 R18 R20	RESISTOR 10K OHM 1/16W 5% 0402 SMD	P10KJCT-ND	PANASONIC	ERJ-2GEJ103X	
31	1	R16	RES 267 OHM 1/16W 1% 0402 SMD	541-267LCT-ND	VISHAY-DALE	CRCW0402267RFKED	
32	1	R22	RESISTOR 1.00M OHM 1/16W 1% 0402 SMD	311-1.00MLRCT-ND	YAGEO	RC0402FR-071ML	R22
33	1	R23	RESISTOR 12.0K OHM 1/16W 1% 0402 SMD	311-12.0KLRCT-ND	YAGEO	RC0402FR-0712KL	
34	1	R32	RESISTOR 82.0K OHM 1/10W 1% 0603 SMD	311-82.0KHRCT-ND	YAGEO	RC0603FR-0782KL	
35	5	R33 R35 R37 R39 R50	RESISTOR 33K OHM 1/10W 1% 0603	311-33.0KHRCT-ND	YAGEO	RC0603FR-0733KL	
36	1	R34	RESISTOR 68.0K OHM 1/10W 1% 0603 SMD	311-68.0KHRCT-ND	YAGEO	RC0603FR-0768KL	
37	1	R36	RESISTOR 56K OHM 1/10W 5% 0603 SMD	311-56KGRCT-ND	YAGEO	RC0603JR-0756KL	
38	1	R38	RESISTOR 47.0K OHM 1/10W 1% 0603 SMD	311-47.0KHRCT-ND	YAGEO	RC0603FR-0747KL	
39	1	R42	RESISTOR 100K OHM 1/10W 1% 0603 SMD	311-100KHRCT-ND	YAGEO	RC0603FR-07100KL	
40	1	R61	RESISTOR 330 OHM 1/16W 3300PPM 5% 0603	P330CHCT-ND	PANASONIC	ERA-V33J331V	
41	1	SW1	SWITCH TACTILE 6MM EXTEND ACT 160GF	EG1861-ND	E-SWITCH	TL1105SPF160Q	
42	1	SW2	SWITCH DIP 8POS HALF PITCH 24V	CKN9067-ND	C&K	TDA08H05B1	
43	1	SW3	SW SLIDE DPDT 6VDC 0.3A PCMNT	401-2001-ND	C&K	JS202011CQN	
44	1	SW4	DIPSWITCH 2POS HALF PITCH SMT	CKN9064-ND	C&K	TDA02H05B1	
45	4	TP1 TP2 TP3 TP4	TEST POINT LOOP COMPACT BLACK	5006K-ND	KEYSTONE		5006
46	1	U1	IC REG LDO 3.3V 0.5A SOT223-3	TC1262-3.3VDBCT-ND	MICROCHIP	TC1262-3.3VDBTR	
47	1	U2	CONV DC/DC 6A 12VIN POL SIP	811-2179-ND	MURATA ELECTRONICS	OKR-T/6-W12-C	
48	1	U3	IC FLASH 64MBIT 80MHZ 8SOIC	SST25VF064C-80-4I-S3AE-ND	MICROCHIP	SST25VF064C-80-4I-S3AE	
49	1	U4	MICROCHIP 4640	CONSIGNED			
50	1	U5 U6 U7 U8 U9	MICROCHIP UCS8100X	CONSIGNED			
51	1	Y1	CRYSTAL HYBRID 24MHZ 6PF SMD	490-5575-1-ND	MURATA ELECTRONICS	XRCGB24M000F0L00R0	



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