



PIC32 USB Starter Kit II User's Guide

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rPIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rLAB, Select Mode, SQI, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

GestIC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2010-2014, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.



Printed on recycled paper.

ISBN: 978-1-62077-977-4

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949 ==

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Table of Contents

Preface	5
Chapter 1. Introduction	
1.1 Kit Contents	11
1.2 PIC32 Functionality and Features	12
Chapter 2. Hardware	
2.1 Hardware Features	15
Appendix A. Board Layout and Schematics	
A.1 PIC32 USB Starter Kit II Development Board Block Diagram	17
A.2 PIC32 USB Starter Kit II Board Layout	18
A.3 PIC32 USB Starter Kit II Board Schematics	20
Appendix B. Bill of Materials	
Index	29
Worldwide Sales and Service	30

PIC32 USB Starter Kit II User's Guide

NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXXXXXA”, where “XXXXXXXX” 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® X 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 starter kit. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [Recommended Reading](#)
- [The Microchip Web Site](#)
- [Development Systems Customer Change Notification Service](#)
- [Customer Support](#)
- [Document Revision History](#)

DOCUMENT LAYOUT

This document describes how to use the PIC32 (General Purpose) Starter Kit, PIC32 USB Starter Kit II, and the PIC32 Ethernet Starter Kit (all also referred to as “starter kit”) as a development tool to emulate and debug firmware on a target board. This user's guide is composed of the following chapters:

- **Chapter 1. “Introduction”** provides a brief overview of the starter kit, highlighting its features and uses.
- **Chapter 2. “Hardware”** provides the hardware descriptions of the starter kit.
- **Appendix A. “Board Layout and Schematics”** provides a block diagram, board layouts, and detailed schematics of the starter kit.

PIC32 USB Starter Kit II User's Guide

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
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 dialog button	Click OK
	A tab	Click the Power tab
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
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'
<i>Italic Courier New</i>	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) { ... }
Notes	A Note presents information that we want to re-emphasize, either to help you avoid a common pitfall or to make you aware of operating differences between some device family members. A Note can be in a box, or when used in a table or figure, it is located at the bottom of the table or figure.	Note: This is a standard note box.
		CAUTION This is a caution note.
		Note 1: This is a note used in a table.

RECOMMENDED READING

This user's guide describes how to use the starter kit. The following Microchip documents are available and recommended as supplemental reference resources.

PIC32MX5XX/6XX/7XX Family Data Sheet (DS60001156)

Refer to this document for detailed information on PIC32 devices. Reference information found in this data sheet includes:

- Device memory maps
- Device pinout and packaging details
- Device electrical specifications
- List of peripherals included on the devices

MPLAB® XC32 C/C++ Compiler User's Guide (DS50001686)

This document details the use of Microchip's MPLAB XC32 C/C++ Compiler to develop an application.

MPLAB® X IDE User's Guide (DS50002027)

Refer to this document for more information pertaining to the installation and implementation of the MPLAB X IDE software, as well as the MPLAB SIM Simulator software that is included with it.

Universal Serial Bus Specification and Associated Documents

The Universal Serial Bus is defined by the USB 2.0 specification and its associated supplements and class-specific documents. These documents are available from the USB Implementers Forum. See their web site at: <http://www.usb.org>.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at: <http://www.microchip.com>. This web site makes files and information easily available to customers. Accessible by most Internet browsers, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listings
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listings of seminars and events; and listings of Microchip sales offices, distributors and factory representatives

PIC32 USB Starter Kit II User's Guide

DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools
- **Emulators** – The latest information on the Microchip in-circuit emulator, MPLAB REAL ICE™
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 3
- **MPLAB X IDE** – The latest information on Microchip MPLAB X IDE, the Windows® Integrated Development Environment for development systems tools
- **Programmers** – The latest information on Microchip programmers including the PICkit™ 3 development programmer

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://support.microchip.com>.

DOCUMENT REVISION HISTORY

Revision A (January 2010)

This is the initial release of the PIC32 USB Starter Kit II User's Guide.

Revision B (December 2010)

This revision includes the following updates:

- All references to the PIC32 Starter Kit and PIC32 Ethernet Starter Kit have been removed. User information on these two starter kits can be found in their respective user's guides, which are available from the Microchip web site.
- Formatting changes and minor text updates have been incorporated throughout the document

Revision C (March 2014)

This revision includes the following updates:

- Updated the device name and removed the USBOEN pin from the PIC32MX CPU schematic (see [Figure A-4](#))
- Updated the device name in the Debug CPU schematic (see [Figure A-5](#))
- Removed the USBOEN pin from the Application Board Connector schematic (see [Figure A-6](#))
- Updated the Bill of Materials to include ordering information for components Y3, C15, and C16, which were originally labeled as "Do Not Populate" (DNP) (see [Appendix B. "Bill of Materials"](#))
- Additional formatting changes and minor text updates have been incorporated throughout the document

PIC32 USB Starter Kit II User's Guide

NOTES:

Chapter 1. Introduction

Thank you for purchasing the Microchip Technology PIC32 USB Starter Kit II. This board provides a low-cost, modular development system for Microchip's line of 32-bit microcontrollers (MCUs).

The starter kit is preloaded with demonstration software for the user to explore the new features of the PIC32. It is also expandable through a modular expansion interface, which allows the user to extend its functionality. The starter kit also supplies on-board circuitry for full debug and programming capabilities.

This chapter covers the following topics:

- [Kit Contents](#)
- [PIC32 Functionality and Features](#)

The preprogrammed example code on the PIC32 MCU is available via download from the Microchip web site at <http://www.microchip.com>. All project files have been included so that the code may be used directly to restore the PIC32 MCU on the starter kit to its original state (i.e., if the sample device has been reprogrammed with another program).

1.1 KIT CONTENTS

The PIC32 USB Starter Kit II contains the following items:

- PIC32 USB Starter Kit II Development Board
- USB mini-B to full-sized A cable – USB debug cable to debug and power the board
- USB micro-B to full-sized A cable – PIC32 USB cable to communicate with the PIC32 USB port

<p>Note: If you are missing any part of a kit, contact a Microchip sales office for assistance. A list of Microchip offices for sales and service is provided on the back page of this document.</p>

PIC32 USB Starter Kit II User's Guide

1.2 PIC32 FUNCTIONALITY AND FEATURES

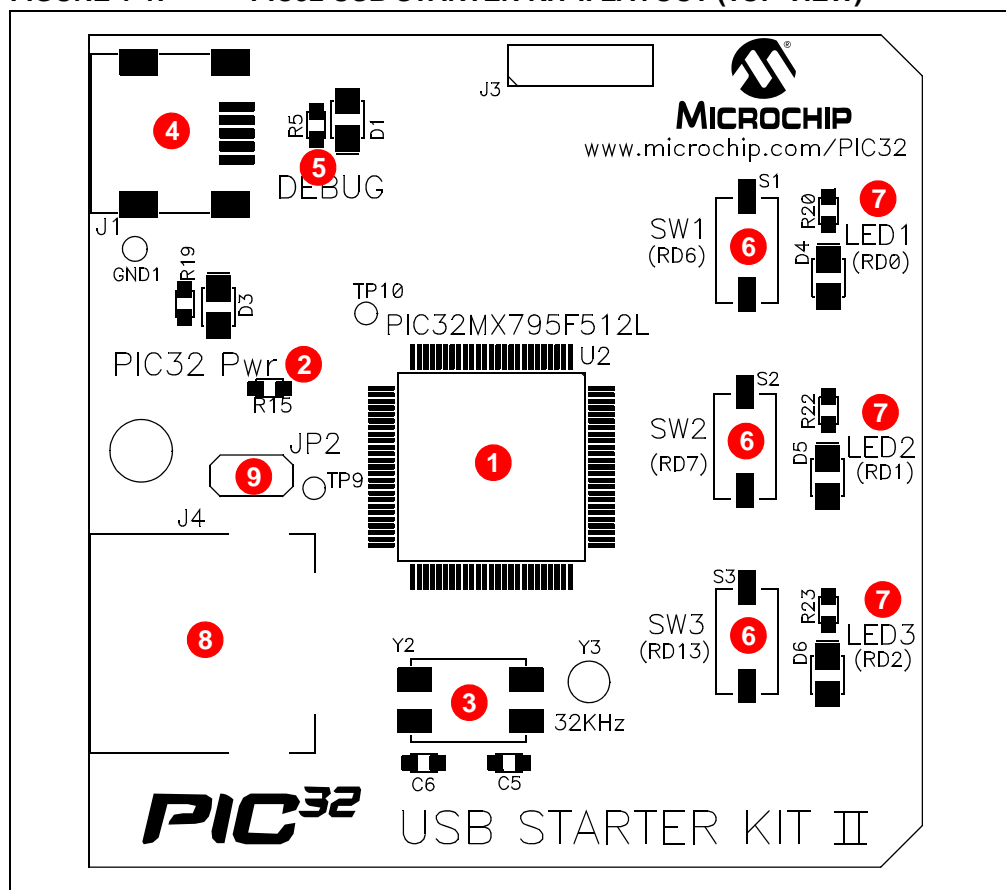
Representations of the layout of the PIC32 USB Starter Kit II are shown in [Figure 1-1](#) and [Figure 1-2](#).

The top assembly of the board includes these key features, as indicated in [Figure 1-1](#):

1. PIC32MX795F512L 32-bit microcontroller.
2. Green power indicator LED.
3. On-board crystal for precision microcontroller clocking (8 MHz).
4. USB connectivity for on-board debugger communications.
5. Orange debug indicator LED.
6. Three push button switches for user-defined inputs.
7. Three user-defined indicator LEDs.
8. USB Type A receptacle connectivity for PIC32 host-based applications.
9. HOST mode power jumper.

Note: When running USB device applications, open the jumper JP2 to prevent possibly back-feeding voltage onto the VBUS from one port on the host to another (or from one host to another).

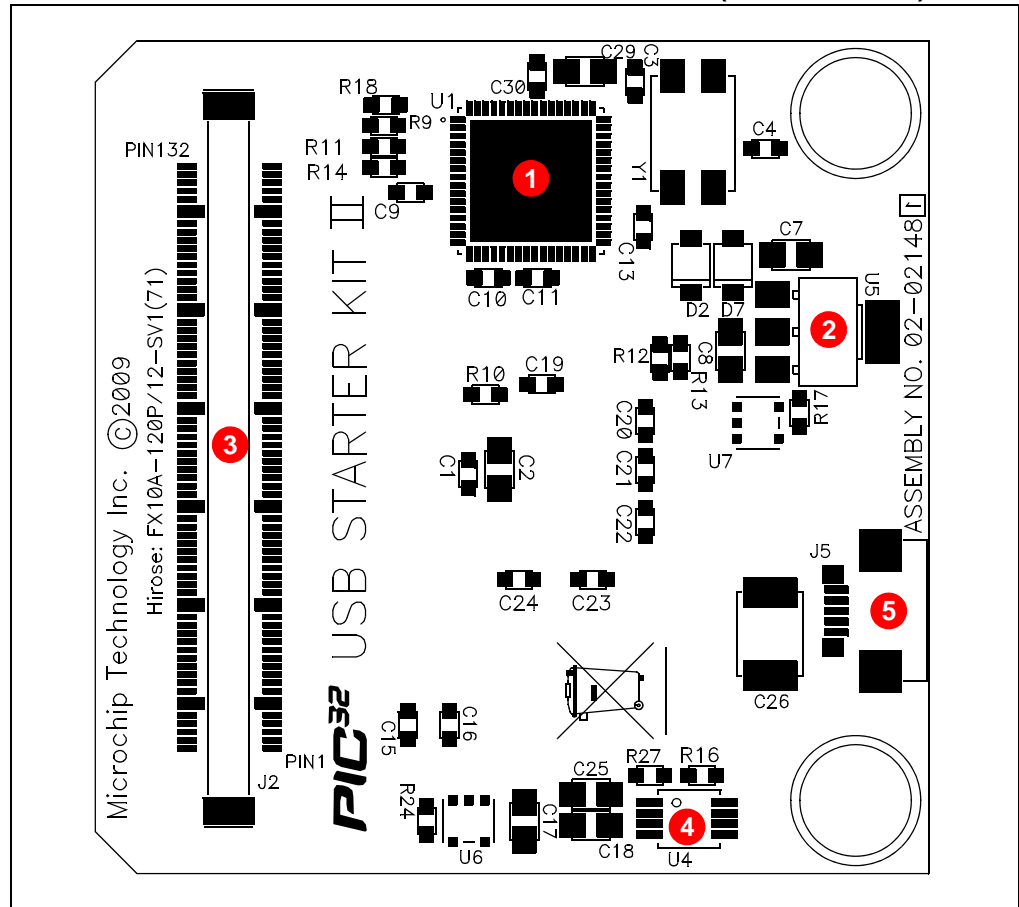
FIGURE 1-1: PIC32 USB STARTER KIT II LAYOUT (TOP VIEW)



The bottom assembly of the board includes these key features, as indicated in [Figure 1-2](#):

1. PIC32MX440F512H USB microcontroller for on-board debugging.
2. Regulated +3.3V power supply for powering the starter kit via USB or expansion board.
3. Connector for various expansion boards.
4. USB Host and OTG power supply for powering PIC32 USB applications.
5. USB Type Micro-AB receptacle for OTG and USB device connectivity for PIC32 OTG/device-based applications.

FIGURE 1-2: PIC32 USB STARTER KIT II LAYOUT (BOTTOM VIEW)



PIC32 USB Starter Kit II User's Guide

NOTES:

Chapter 2. Hardware

This chapter describes the hardware features of the PIC32 USB Starter Kit II.

2.1 HARDWARE FEATURES

The key features of the PIC32 USB Starter Kit II are listed below. They are presented in the order given in [Section 1.2 “PIC32 Functionality and Features”](#). You can refer to [Figure 1-1](#) for their locations on the board.

2.1.1 Processor Support

The PIC32 USB Starter Kit II is designed with a permanently mounted (i.e., soldered) PIC32MX795F512L processor.

2.1.2 Power Supply

There are two ways to supply power to the PIC32 USB Starter Kit II:

- USB bus power connected to USB debug connector J1.
- An external application board with a regulated DC power supply that provides +5V can be connected to the J2 application board connector that is provided on the bottom side of the board.

One green LED (D3) is provided to show that the PIC32 microcontroller is powered up.

2.1.3 Debug USB Connectivity

The PIC32 USB Starter Kit II includes a PIC32MX440F512H USB microcontroller that provides debugger connectivity over USB. The PIC32MX440F512H is hard wired to the PIC32 device to provide two types of protocol translation:

- I/O pins of PIC32MX440F512H to the ICSP™ pins of the PIC32
- I/O pins of PIC32MX440F512H to the JTAG pins of the PIC32

The PIC32 USB Starter Kit II currently uses the JTAG pins of the PIC32 device for programming and debugging.

2.1.4 PIC32 USB Connectivity

There are three possible ways to connect to the PIC32 USB microcontroller:

- **HOST Mode** – Connect the device to the Type A connector J4, located on the top of the starter kit. If using the Debug USB port to power the Host port, install jumper JP2 to short the back-power prevention diode. Note that a maximum of ~400 mA can be supplied from the Debug USB port to the Host port using this method.
If the full 500 mA supply is needed, an external supply must be connected to the application board and jumper JP2 must be removed to prevent back-powering the Debug USB port.

PIC32 USB Starter Kit II User's Guide

- **DEVICE Mode** – Connect the debug Mini-B USB cable to port J1 and then connect the starter kit to the host using a cable with a Type-B Micro plug to the starter kit's Micro A/B port J5, located on the bottom of the starter kit. The other end of the cable must have a Type-A plug. Connect it to a USB host. Jumper JP2 should be removed.
- **OTG Mode** – Connect the starter kit to the OTG device using an OTG Micro A/B cable to the Micro A/B port J5, located on the bottom side of the starter kit. The starter kit provides an on-board power supply capable of providing 120 mA Max. This supply is controlled by the PIC32MX795F512L microcontroller. Jumper JP2 should be removed.

2.1.5 Switches

Push button switches provide the following functionality:

- SW1: Active-low switch connected to RD6
- SW2: Active-low switch connected to RD7
- SW3: Active-low switch connected to RD13

The switches do not have any debounce circuitry and require the use of internal pull-up resistors; this allows you to investigate software debounce techniques. When Idle, the switches are pulled high (+3.3V). When pressed, they are grounded.

2.1.6 LEDs

The RD0 through RD2 LEDs are connected to PORTD of the processor. The PORTD pins are set high to light the LEDs.

2.1.7 Oscillator Options

The installed microcontroller has an oscillator circuit connected to it. The main oscillator uses an 8 MHz crystal (Y2) and functions as the controller's primary oscillator. Use of an external crystal is required to develop USB applications. The USB specification dictates a frequency tolerance of $\pm 0.25\%$ for full speed. Non-USB applications can use the internal oscillators. The starter kit also has provisions for an external secondary oscillator (Y3); however, this is not populated.

The PIC32MX440F512H is independently clocked and has its own 8 MHz crystal (Y1).

2.1.8 120-Pin Modular Expansion Connector

The PIC32 USB Starter Kit II has been designed with a 120-pin modular expansion interface, which allows the board to provide basic generic functionality now, and easy extendability to new technologies as they become available.

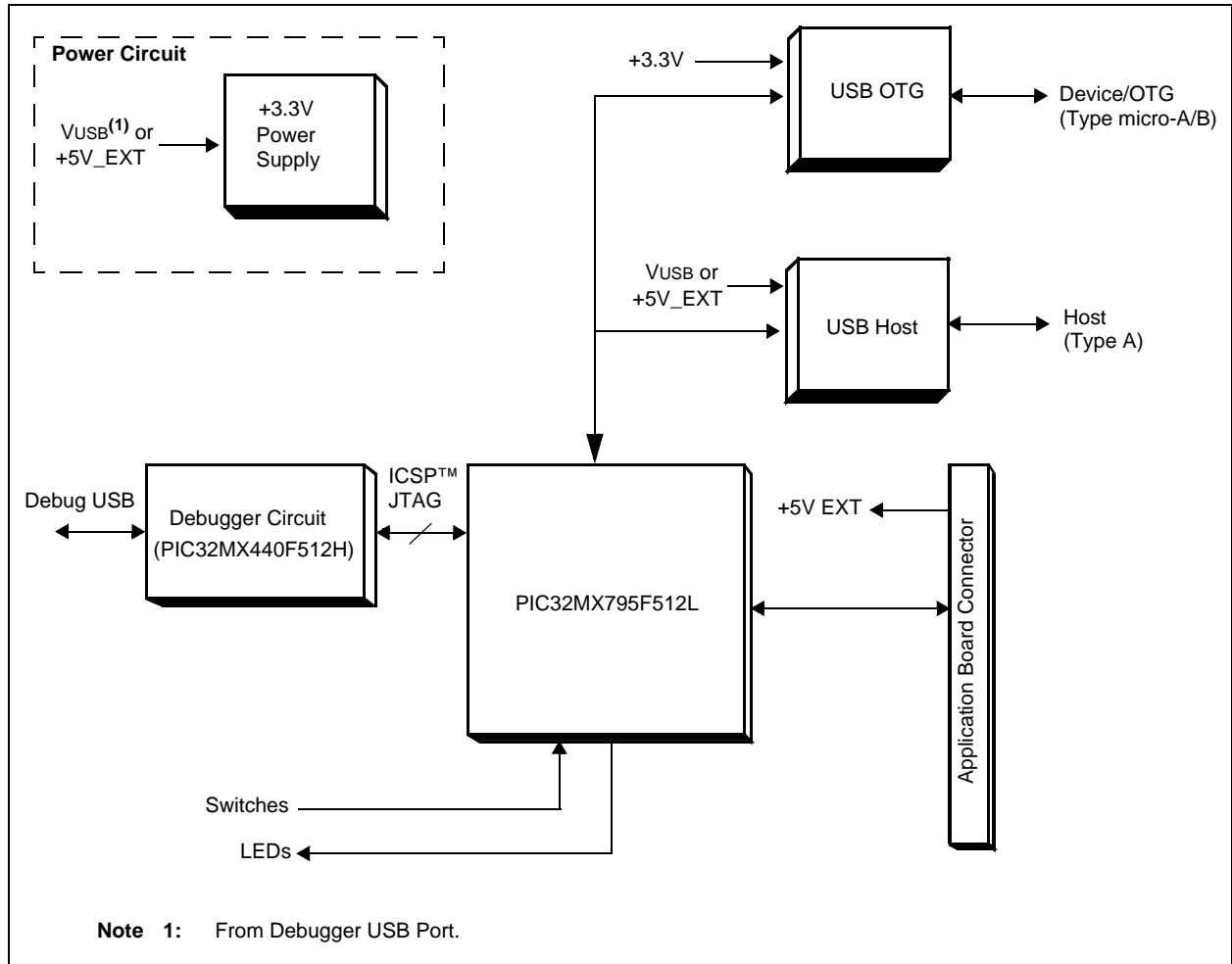
TABLE 2-1: STARTER KIT CONNECTOR PART NUMBERS

Connector	HIROSE Electric PN
Starter Kit Connector	FX10A-120P/12-SV1(71)
Application Board Connector	FX10A-120S/12-SV(71)

Appendix A. Board Layout and Schematics

A.1 PIC32 USB STARTER KIT II DEVELOPMENT BOARD BLOCK DIAGRAM

FIGURE A-1: HIGH-LEVEL BLOCK DIAGRAM OF THE PIC32 USB STARTER KIT II BOARD



PIC32 USB Starter Kit II User's Guide

A.2 PIC32 USB STARTER KIT II BOARD LAYOUT

FIGURE A-2: PIC32 USB STARTER KIT II LAYOUT (TOP ASSEMBLY)

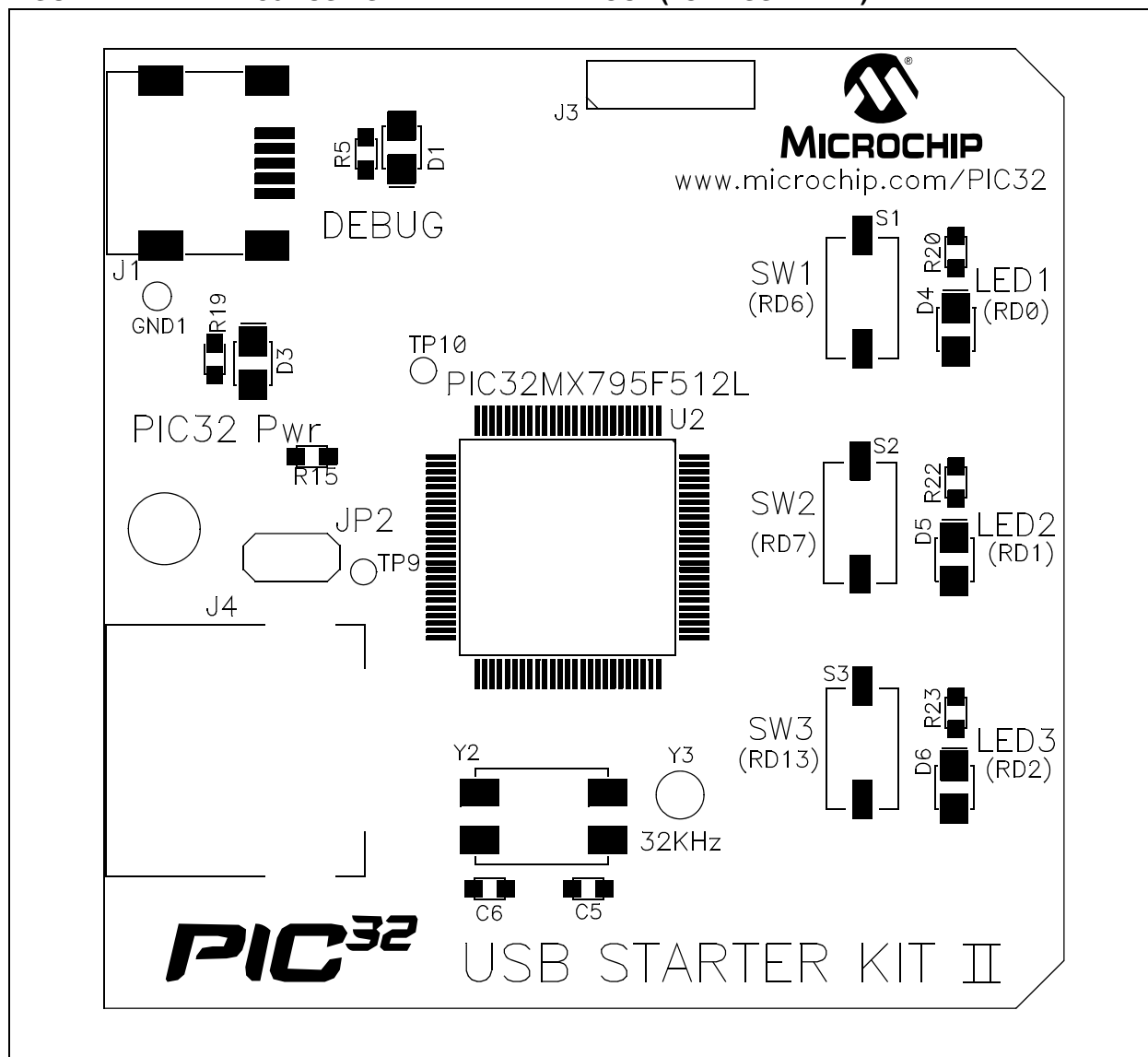


FIGURE A-3: PIC32 USB STARTER KIT II LAYOUT (BOTTOM ASSEMBLY)

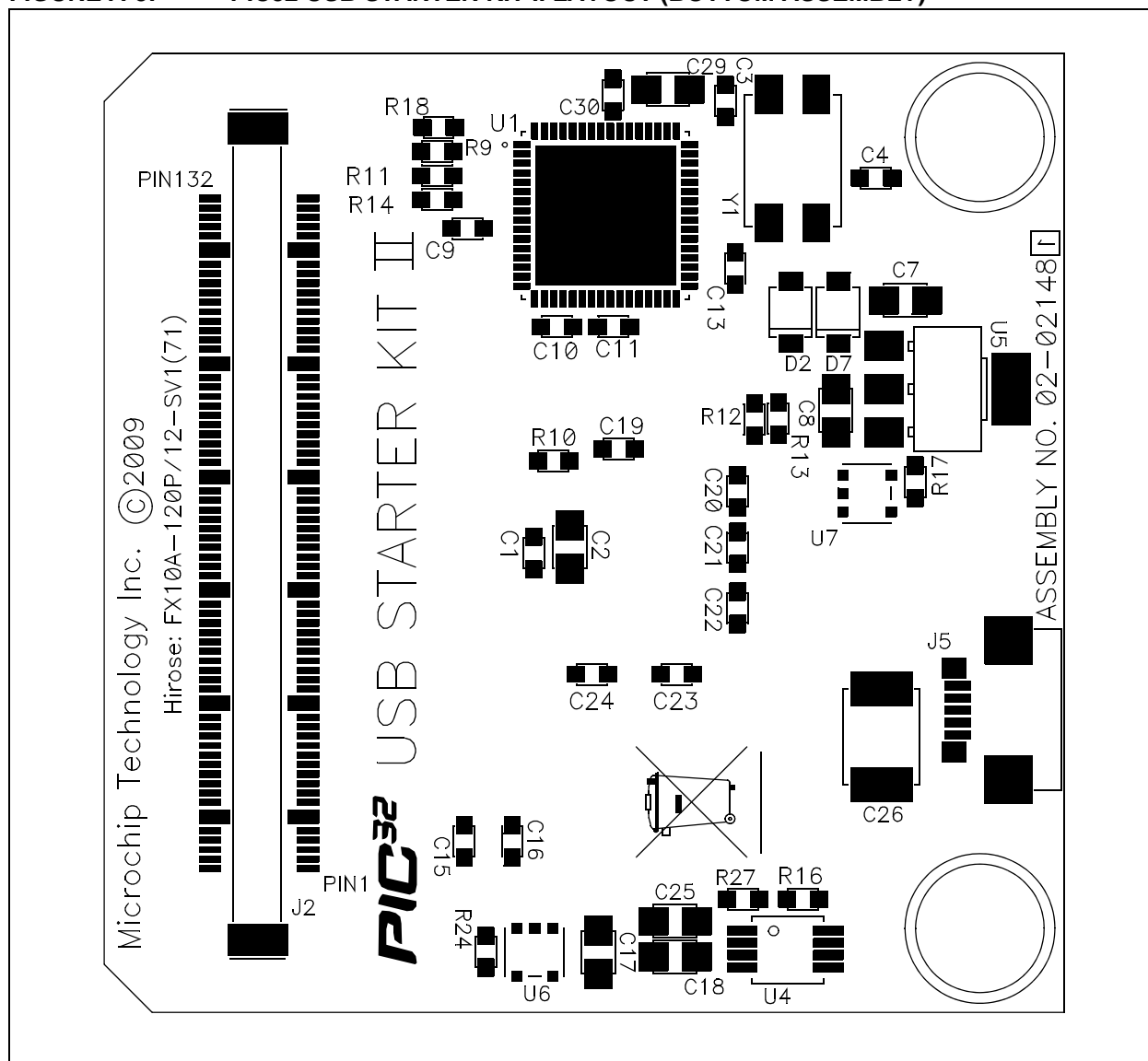
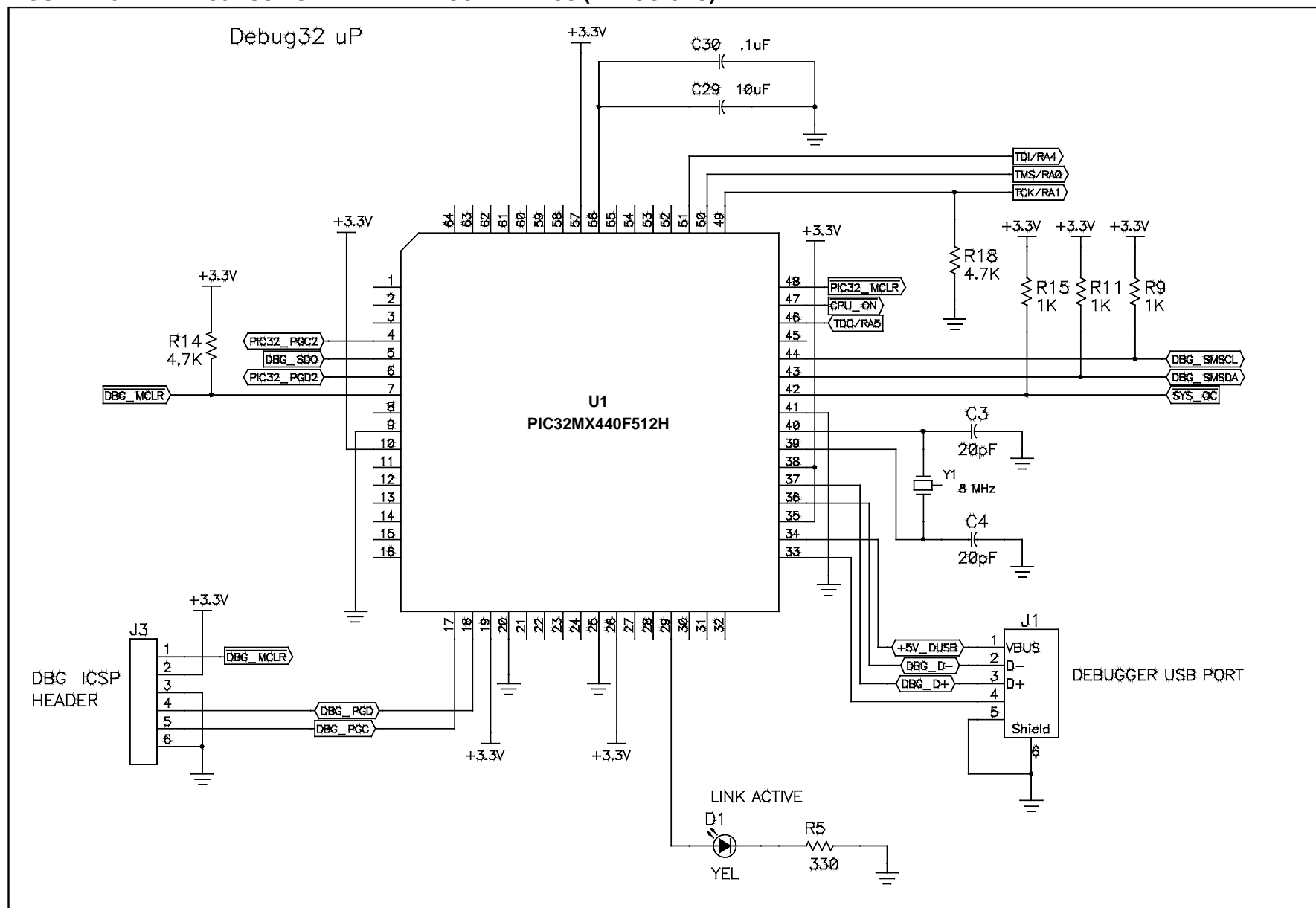


FIGURE A-5: PIC32 USB STARTER KIT II SCHEMATICS (DEBUG CPU)

PIC32 USB Starter Kit II User's Guide

FIGURE A-6: PIC32 USB STARTER KIT II SCHEMATICS (APPLICATION BOARD CONNECTOR)

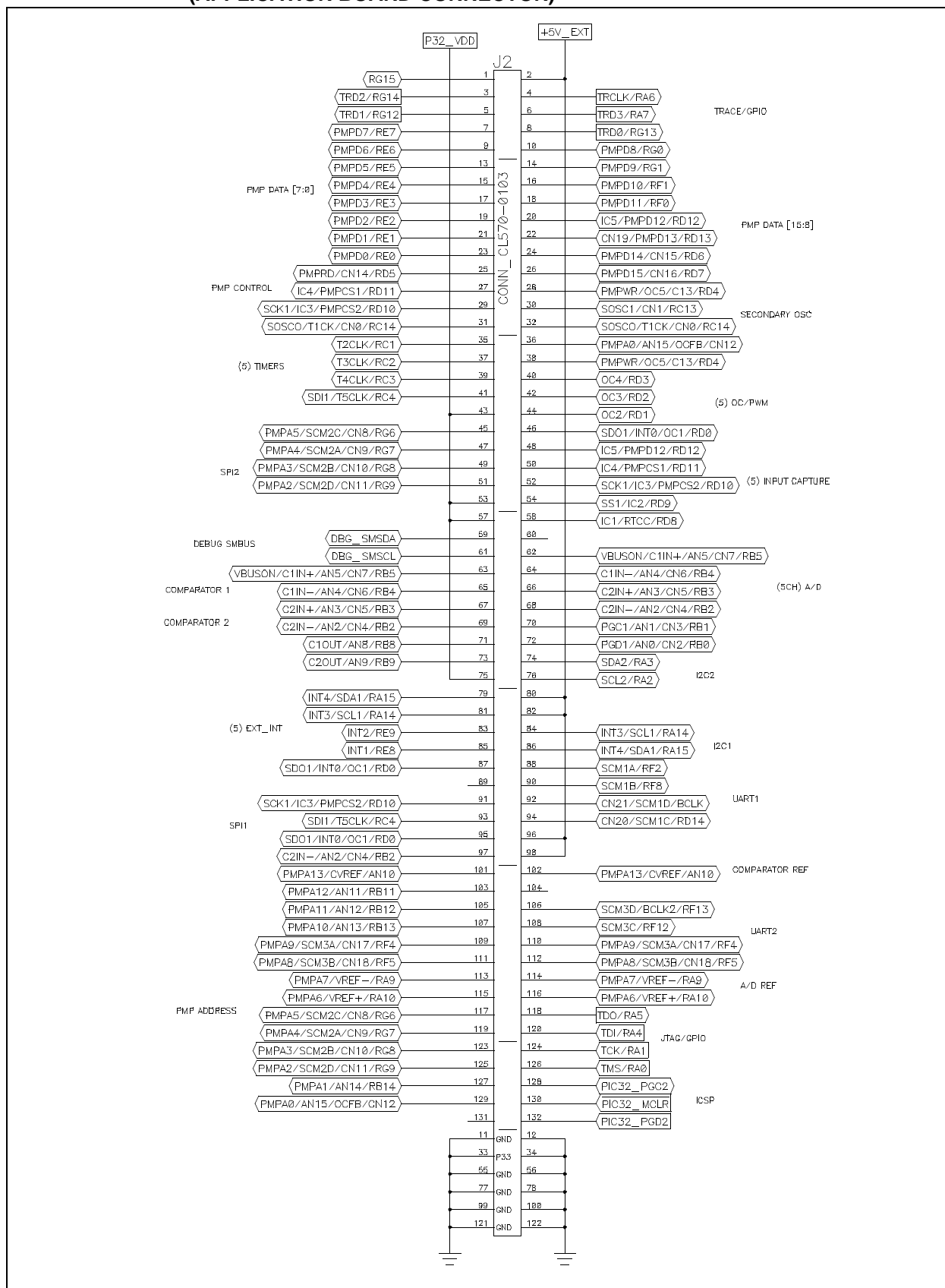
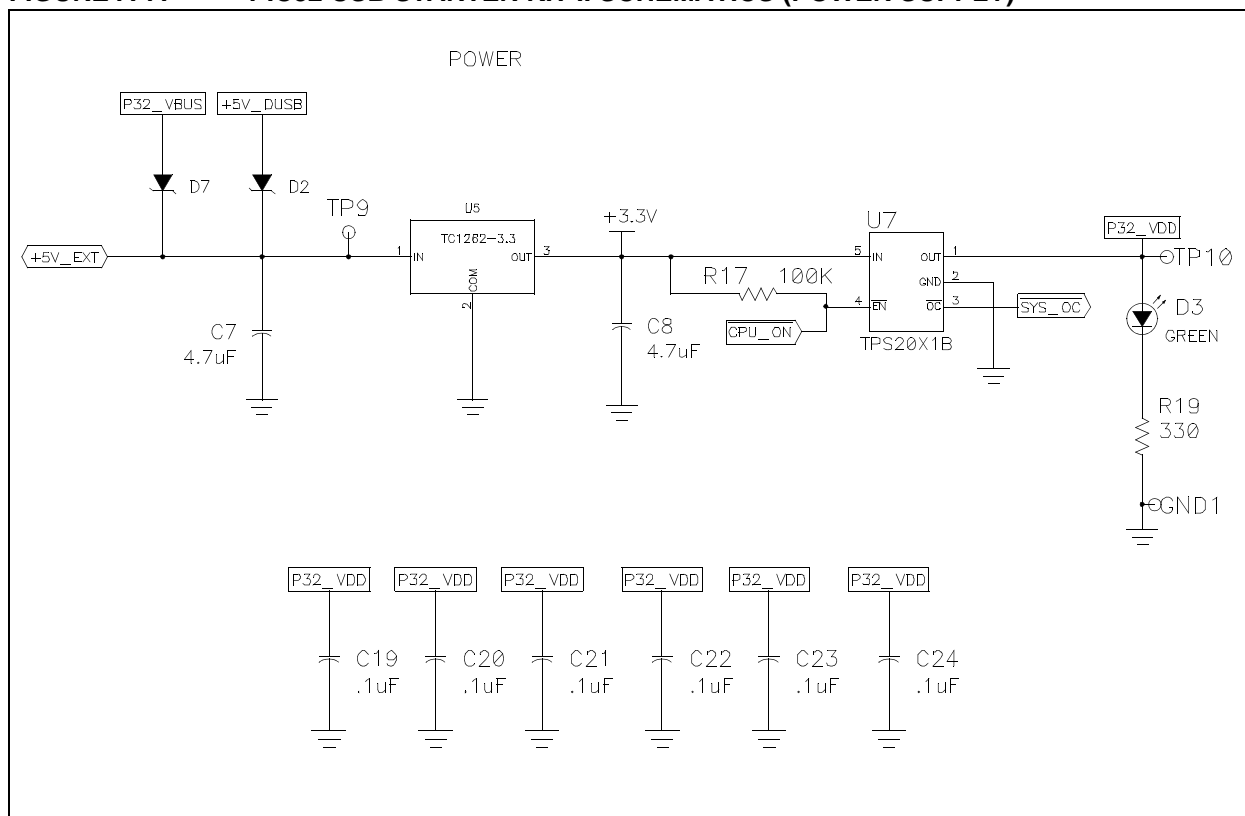


FIGURE A-7: PIC32 USB STARTER KIT II SCHEMATICS (POWER SUPPLY)



PLC32 USB Starter Kit II User's Guide

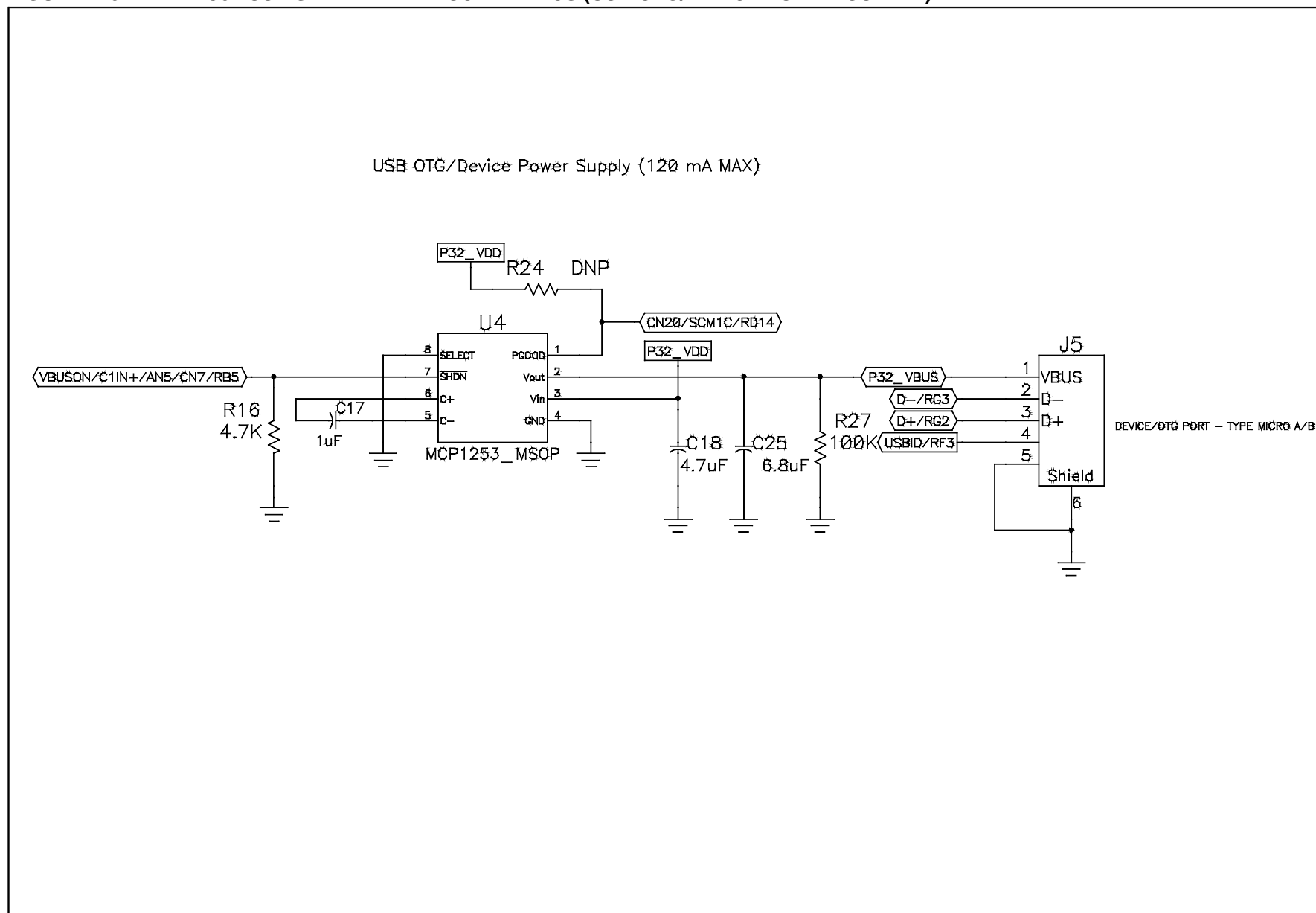
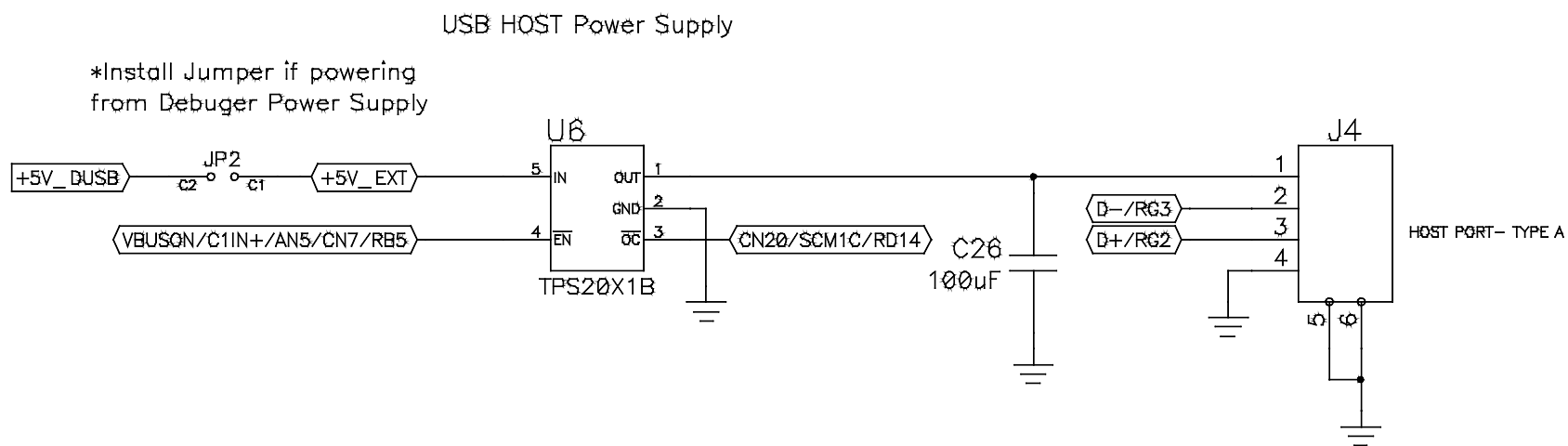
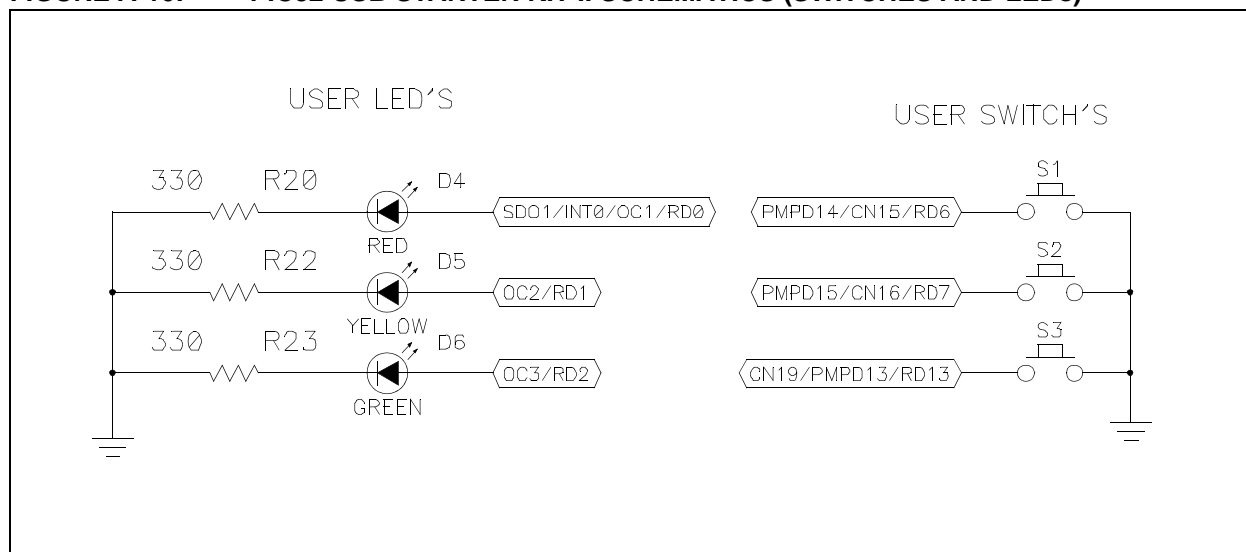


FIGURE A-9: PIC32 USB STARTER KIT II SCHEMATICS (USB HOST POWER SUPPLY)

PIC32 USB Starter Kit II User's Guide

FIGURE A-10: PIC32 USB STARTER KIT II SCHEMATICS (SWITCHES AND LEDs)



Appendix B. Bill of Materials

TABLE B-1: PIC32 USB STARTER KIT II BILL OF MATERIALS

Reference	Description	Manufacturer	Part No.
U4	IC SMT, MCP1253, DC/DC Converter 3.3V 8L MSOP	Microchip	MCP1253-33X50I/MS
U1	IC SMT, PIC32MX440F512H-80I/MR 64P QFN	Microchip	PIC32MX440F512H-80I/MR
U2	IC SMT, PIC32MX795F512L 100L TQFP	Microchip	PIC32MX795F512L-80I/PT
U5	IC SMT, TC1262-3.3VDB, SOT-223	Microchip	TC1262-3.3VDBTR
C1, C9, C10, C11, C13, C30, C19-C24	CAP SMT, 0.1 μ F 0603 CER 16V 10% X7R	Panasonic	ECJ-1VB1C104K
C17	CAP SMT, 1.0 μ F 0805 CER 16V 10% X7R	Kemet	C0805C105K4RACTU
C2, C29	CAP SMT, 10 μ F 0805 CER 6.3V 20% , X5R	Murata	GRM21BF50J106ZE01L
C7, C8	CAP SMT, 4.7 μ F 0805 CER 16V +80-20% Y5V	Panasonic	ECJ-2FB0J475K
C3-C6	CAP SMT, 20 pF 0603 CER 50V, 5% C0G	Rohm	MCH185A200JK
C25	CAP SMT, 6.8 μ F 0805 CER 6.3V 10% X5R	Kemet	C0805C685K9PACTU
C26	CAP SMT, 100 μ F 1812 CER 6.3V -20%,+80% Y5V	Panasonic	ECJ-5YF0J107Z
JP2	CONN, HDR, 1x2 Breakaway, 0.100" Pitch, 0.025 SQ Post (0.100"/0.230")	Molex	90120-0762
	CONN, Shunt, 2-Pin Shorting Shunt (.100" Spacing)	Sullins	SSC02SYAN
J1	CONN SMT, RECPT, USB Mini-B 5POS RA	Delphi	15430262-110
J2	CONN, SMT, HDR, 120P, W/Post	Hirose Electronics	FX10A-120P/12-SV1(71)
J4	CONN, RECPT, USB TYPE-A w/Board Lock	FCI	87520-0010BLF
J5	CONN, RECPT, USB Micro-B R/A	Hirose Electronics	ZX62-AB-5PA
D2, D7	DIODE SMT, Schottky 30V 0.5A SOD-123	Diodes Inc.	B0530W-7-F
U6	IC SMT, TPS20X1 0.75A Power Dist Switch 5-SOT23	Texas Instruments	TPS2051BDBVR
U7	IC SMT, TPS2041 1A PWR Dist Switch SNGL SOT23-5	Texas Instruments	TPS2041BDBVR
D4	LED SMT, 0805 Red DIFF 2x1.25 mm Thin	Lumex	SML-LXT0805IW-TR
D1, D5	LED SMT, 0805 Yellow DIFF 2x1.25 mm Thin	Lumex	SML-LXT0805YW-TR
D3, D6	LED SMT, 0805 Green DIFF 2x1.25 mm	Lumex	SML-LXT0805GW-TR
Y1, Y2	OSC SMT, 8.0 MHz Crystal 20PF	Fox Electronics	FQ7050B-8
R9, R11, R12, R15	RES SMT, 1.0 K Ω 1/10W 5% 0603	Panasonic	ERJ-3GEYJ102V
R10, R13, R14, R16, R18	RES SMT, 4.7 K Ω 1/10W 5% 0603	Panasonic	ERJ-3GEYJ472V

PIC32 USB Starter Kit II User's Guide

TABLE B-1: PIC32 USB STARTER KIT II BILL OF MATERIALS (CONTINUED)

Reference	Description	Manufacturer	Part No.
R5, R19, R20, R22, R23	RES SMT, 330Ω 1/10W 5% 0603	Panasonic	ERJ-3GEYJ331V
R17	RES SMT, 100 KΩ 1/10W 1% 0603	Panasonic	ERJ-3EKF1003V
S1-S3	Switch, Light Touch 160 gF	Panasonic	EVQ-PPBA25
Y3	CRYSTAL 32 kHz 11 pF THRU	Epson	C-2 32.0000K-P:PBFREE
C15, C16	CAP CER 11 pF 50V 5% NP0 0603	TDK	C1608C0G1H110J
C18, GND1, J3, R24, R27, TP9, TP10	Spare Location, Do Not Populate	—	—

Index

C

Customer Change Notification Service	8
Customer Support	8

D

Documentation	
Conventions	6

H

Hardware Features	
LEDs	15, 16
Oscillator Options	16
PICtail Plus Card Edge Connectors	16
Power Supply	15
Processor Support	15
Switches	16
USB Connectivity	15

I

Internet Address	7
------------------------	---

M

Microchip Internet Web Site	7
MPLAB IDE Simulator, Editor User's Guide	7

P

PIC32	
Layout	
32-bit microcontroller	12
Connector for expansion boards	12
Debug indicator LED	12
Expansion board connector	13
HOST mode power jumper	12
On-board crystal	12
Power supply	13
Power-indicator LED	12
Switches	12
USB connectivity	12
USB Host and OTG power supply	13
USB microcontroller	13
USB Type A receptacle	12
USB Type Micro-AB receptacle	13
User-defined LEDs	12

S

Starter Kit Board	
Block Diagram	17
Starter Kit Layout	
Bottom Assembly	13, 19
Top Assembly	12, 18
Starter Kit Schematics	
Sheet 1 of 3	20, 22
Sheet 2 of 3	21, 23
Sheet 3 of 3	24, 25, 26

U

USB	
Connectivity	15

W

WWW Address	7
-------------------	---

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110

Canada - Toronto
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2943-5100
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8864-2200
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-3019-1500

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880-3770
Fax: 81-3-6880-3771

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Dusseldorf
Tel: 49-2129-3766400

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Pforzheim
Tel: 49-7231-424750

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Venice
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Poland - Warsaw
Tel: 48-22-3325737

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Microchip:](#)

[DM320003-2](#)