dsPIC33CK Curiosity Development Board User's Guide

© 2019 Microchip Technology Inc.

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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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 unless otherwise stated.

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.

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

Trademarks

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Heldo, JukeBlox, KeeLoq, Kleer, LANCheck, LINK MD, maXStylus, maXTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KleerNet, KleerNet logo, memBrain, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA 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.

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

GestIC is a registered trademark 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.

© 2019, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-4357-5

© 2019 Microchip Technology Inc.

Table of Contents

Preface **5**

Chapter 1. Overview **9**

1.1 Introduction 9

Chapter 2. Hardware **13**

2.1 Powering the Board 13

2.1.1 USB Power 13

2.1.2 External Power 13

2.1.3 mikroBUS™ Power 13

2.2 Using the Programmed Demo Firmware 13

2.3 Reprogramming and Debugging the dsPIC33CK256MP508 Device 13

2.4 Using the USB-UART Interface 14

2.5 Circuit Details 15

2.5.1 Jumpers/Headers/Connectors 15

2.5.2 User Interface (UI) 15

2.5.3 ADC Op Amp Analog RC Section 16

Appendix A. Board Layout and Schematics **17**

A.1 Pinout 17

A.2 dsPIC33CK Curiosity Development Board Schematics 20

A.3 dsPIC33CK Curiosity Development Board PCB Layout 28

Appendix B. Bill of Materials (BOM) **31**

B.1 Bill of Materials – dsPIC33CK Curiosity Development Board 31

Worldwide Sales and Service **36**

© 2019 Microchip Technology Inc.

NOTES:

© 2019 Microchip Technology Inc.

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 website (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® 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 dsPIC33CK Curiosity Development Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Product Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This user's guide provides an overview of the dsPIC33CK Curiosity Development Board. The document is organized as follows:

- **Chapter 1. "Overview"** – This chapter introduces the dsPIC33CK Curiosity Development Board and provides a brief overview of its various features.
- **Chapter 2. "Hardware"** – This chapter describes how to program/debug the board using the on-board programmer and the main circuit elements of the board.
- **Appendix A. "Board Layout and Schematics"** – This appendix provides schematic diagrams for the dsPIC33CK Curiosity Development Board.
- **Appendix B. "Bill of Materials (BOM)"** – This appendix provides the component list used in assembling the board.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

© 2019 Microchip Technology Inc.

RECOMMENDED READING

This user's guide describes how to use the dsPIC33CK Curiosity Development Board. The device-specific data sheets contain current information on programming the specific microcontroller or Digital Signal Controller (DSC) devices. The following Microchip documents are recommended as supplemental reference resources:

MPLAB® XC16 C Compiler User's Guide (DS50002071)

This comprehensive guide describes the usage, operation and features of Microchip's MPLAB XC16 C compiler (formerly MPLAB C30) for use with 16-bit devices.

MPLAB® X IDE User's Guide (DS50002027)

This document describes the installation and implementation of the MPLAB X IDE software.

dsPIC33CK256MP508 Family Data Sheet (DS70005349)

Refer to this document for detailed information on the dsPIC33CK single core Digital Signal Controllers (DSCs). 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

and are available for download from the Microchip website (www.microchip.com).

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website 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 listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events; and listings of Microchip sales offices, distributors and factory representatives

PRODUCT 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 website at www.microchip.com, click on **Product Change Notification** and follow the registration instructions.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Corporate Application Engineer (CAE)
- Embedded Solutions Engineer (ESE)
- Field Application Engineer (FAE)

Customers should contact their distributor, representative or Embedded Solutions Engineer (ESE) 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 website at:

http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (April 2019)

This is the initial release of this document.

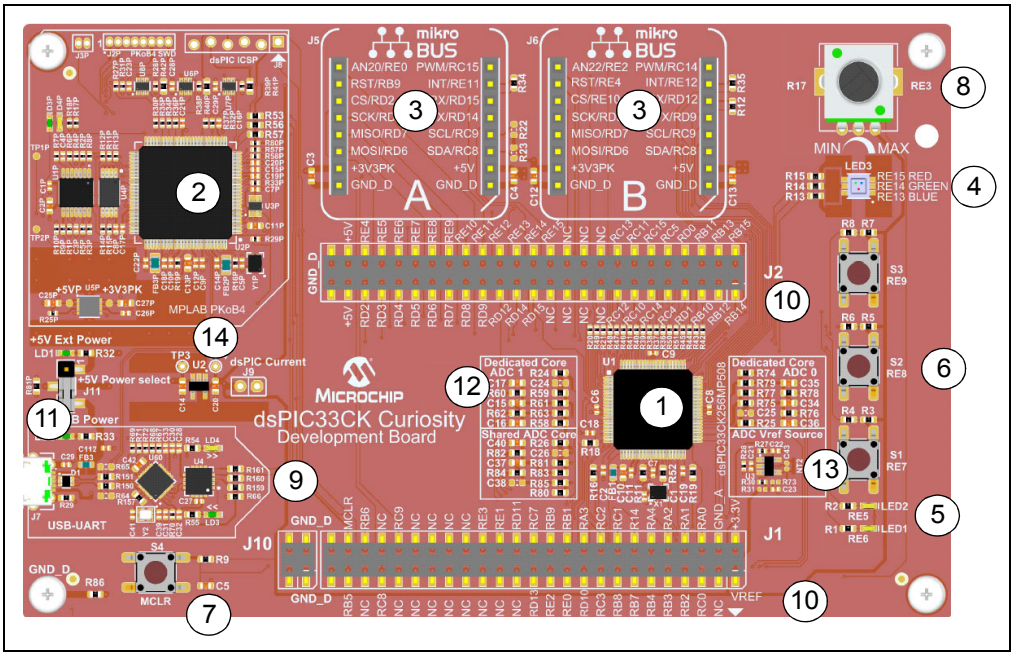
© 2019 Microchip Technology Inc.

Chapter 1. Overview

1.1 INTRODUCTION

The dsPIC33CK Curiosity Development Board (DM330030) is intended as a cost-effective development and demonstration platform for the dsPIC33CK256MP508 family of single core, high-performance Digital Signal Controllers (DSCs). The main hardware features of the board are highlighted in Figure 1-1.

FIGURE 1-1: dsPIC33CK CURIOSITY DEVELOPMENT BOARD



1. dsPIC33CK256MP508 single core, 16-bit Digital Signal Processor (DSP) target device.
2. Integrated PICkit™ On-Board 4 (PKOB4) programmer/debugger.
3. 2x mikroBUS™ interfaces for hardware expansion, compatible with a wide range of existing click boards™ from MikroElektronika (www.mikroe.com).
4. 1x Red/Green/Blue (RGB) LED.
5. 2x general purpose orange indicator LEDs.
6. 3x general purpose push buttons.
7. 1x $\overline{\text{MCLR}}$ Reset push button.
8. 10k potentiometer.
9. USB to UART interface.
10. Female, 100 mil pitch, I/O pin access headers for probing and connecting to all target microcontroller GPIO pins.

11. Configurable jumper (J11) for selecting +5V USB power or +5V external power.
12. Analog input section for dedicated ADC Core 0, Core 1 and shared core.
13. ADC reference generator MCP6021 op amp.
14. dsPIC33CK LDO.

Figure 1-2 and Figure 1-3 show the block diagrams of the dsPIC33CK Curiosity Development Board and the PKOB main system. For more detailed schematics, refer to **Appendix A. "Board Layout and Schematics"**.

© 2019 Microchip Technology Inc.

FIGURE 1-2: dsPIC33CK CURIOSITY DEVELOPMENT BOARD BLOCK DIAGRAM

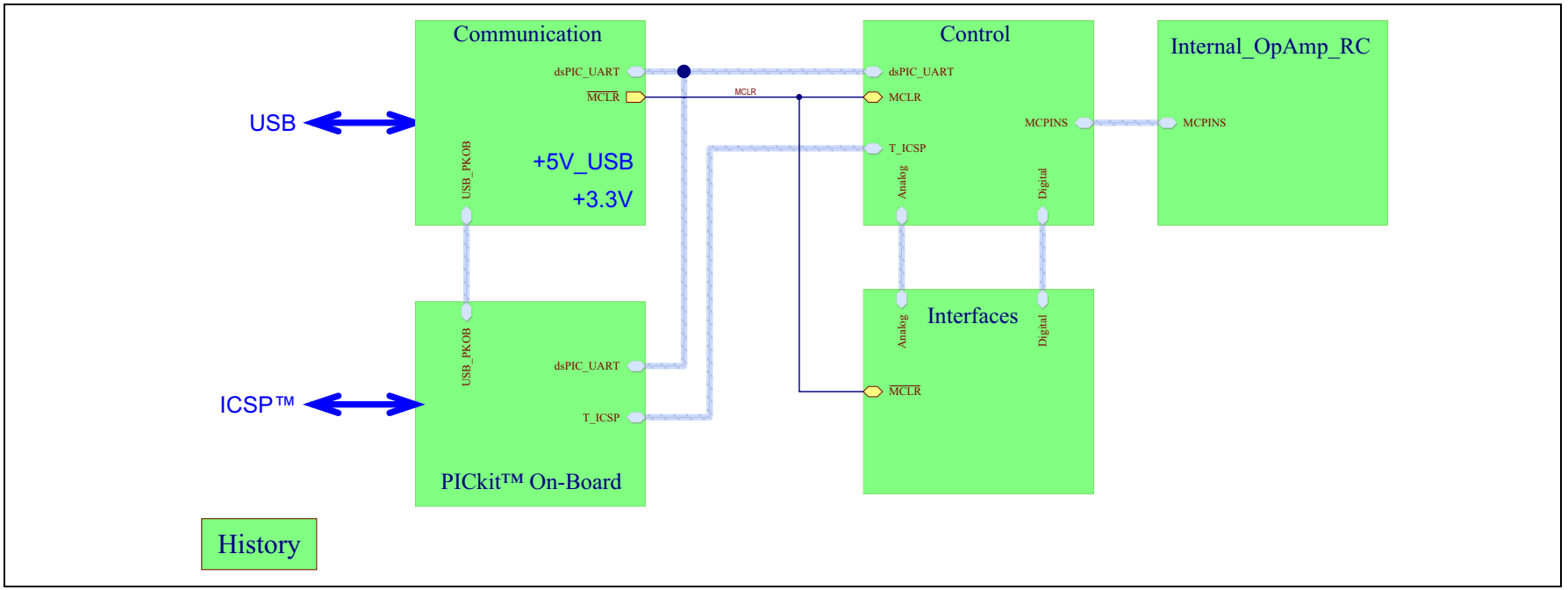
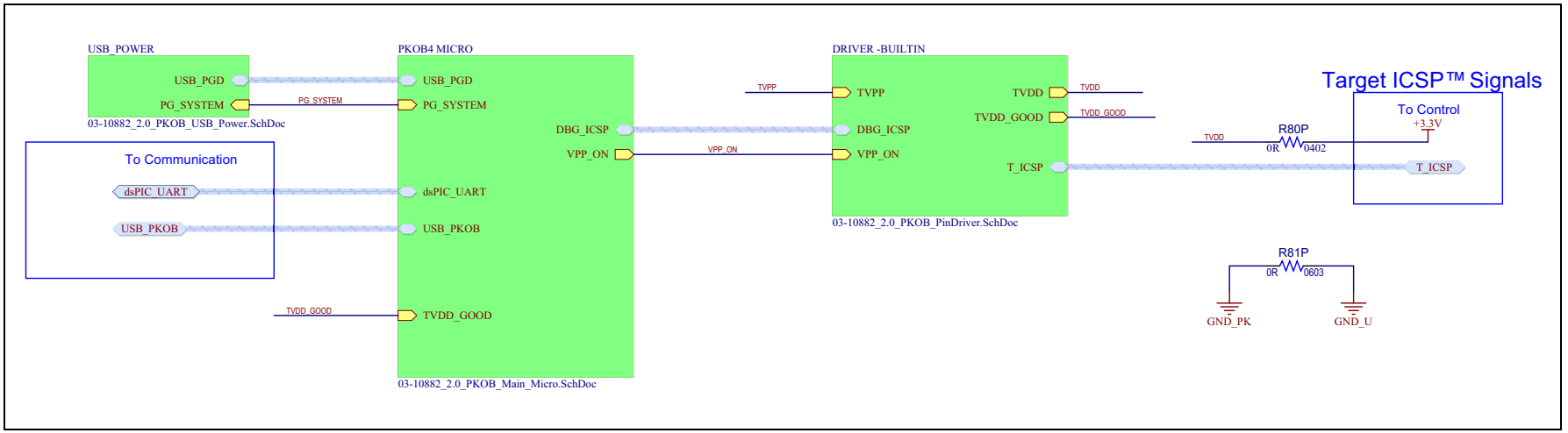


FIGURE 1-3: PKOB MAIN SYSTEM INTERCONNECT



© 2019 Microchip Technology Inc.

NOTES:

© 2019 Microchip Technology Inc.

Chapter 2. Hardware

2.1 POWERING THE BOARD

2.1.1 USB Power

This board is intended to be primarily powered from the USB Micro-B connector, J7. The official *"USB 2.0 Specification"* restricts USB applications to consuming no more than 500 mA of USB VBUS power from the host.

2.1.2 External Power

An external +5 VDC may optionally be connected through the J2, J4 100 mil connector, and the 2-pin jumper should be moved from +5V USB to +5V external power on the J11 3-pin connector.

An external +3.3 VDC may optionally be connected through the J1, J3 100 mil connector to power an external circuit from the dsPIC33CK LDO. However, a *maximum* of 50 mA consumption is recommended.

2.1.3 mikroBUS™ Power

An external +5 VDC may optionally be connected through the J2, J4 100 mil connector. In this case, the 2-pin jumper should be moved from +5V USB to +5V external power on the J11 3-pin connector. A maximum of 400 mA is recommended to be supplied to the mikroBUS click boards™.

The mikroBUS +3.3 VDC power is connected to the +3V3PK on the PKOB4 LDO, which can supply up to 500 mA.

2.2 USING THE PROGRAMMED DEMO FIRMWARE

The development board comes programmed with some basic demo firmware, which exercises several of the board hardware features. The demo project for the dsPIC33CK Curiosity Development Board implements an RGB color mixing application. In the demo, the potentiometer can be used to adjust each color channel intensity independently, while the push buttons are used to select the channel to be adjusted.

The source code for the demo can be obtained from:

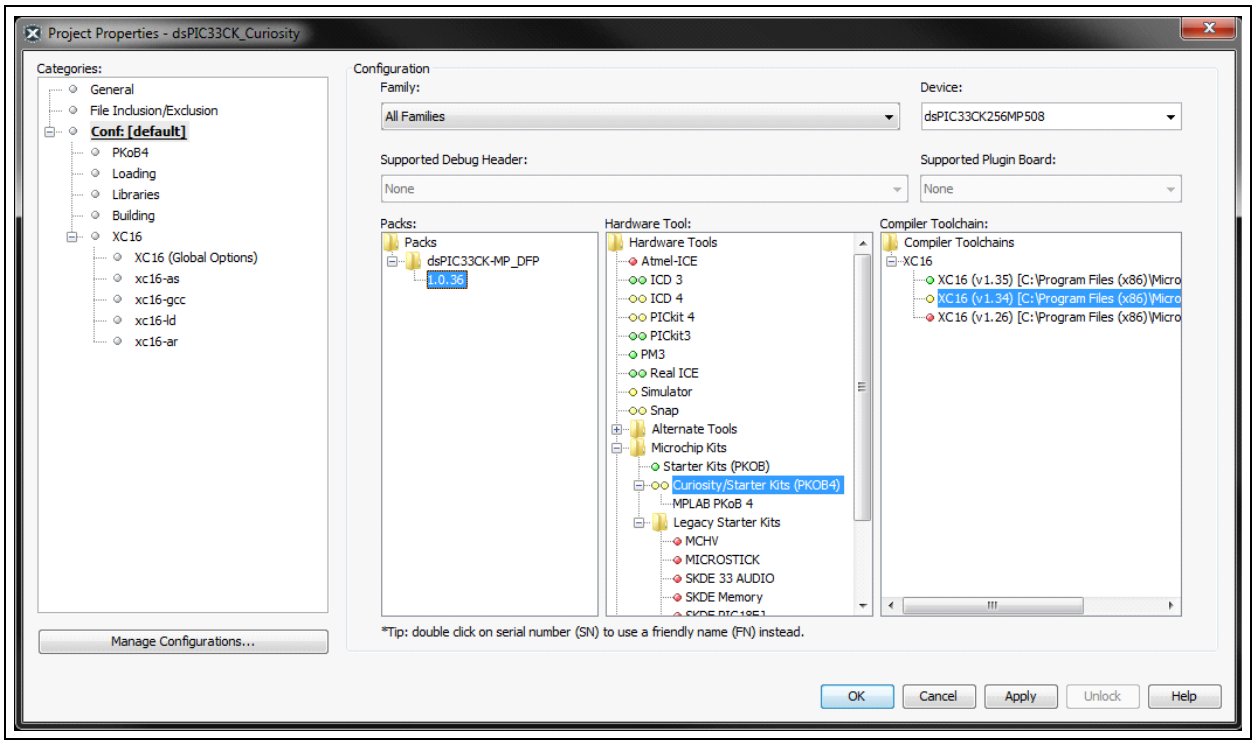
www.microchip.com/dspic33ckcuriosity

2.3 REPROGRAMMING AND DEBUGGING THE dsPIC33CK256MP508 DEVICE

The board has a PICkit™ On-Board (PKOB) programmer/debugger circuit, which can be used to program and debug the dsPIC33CK256MP508 target device (U1). Alternatively, an external programmer/debugger tool can be connected to the board via the 6-pin in-line connector J8, using a male-male 100 mil pitch 6-pin header.

The PKOB circuit should automatically enumerate and be recognized by the MPLAB® X IDE, v5.05 or later, when the dsPIC33CK Curiosity Board is connected to the host via the USB Micro-B connector, J7. No custom USB driver installation is necessary as the PKOB circuit relies on standard OS provided Human Interface Device (HID) drivers, and therefore, the driver installation should be fully automatic. When plugged in, the PKOB programmer/debugger tool can be selected from the MPLAB X project properties page by selecting the device under: *Hardware Tools>Microchip Kits>Starter Kits (PKOB)>Curiosity/Starter Kits (PKOB4)*, as shown in Figure 2-1.

FIGURE 2-1: dsPIC33CK CURIOSITY PKOB TOOL SELECTION



2.4 USING THE USB-UART INTERFACE

The board is equipped with a USB-UART interface based around the MCP2221A chip. The MCP2221A chip implements the standard Communication Device Class (CDC) – Abstract Control Model (ACM) protocol, and therefore, can use standard USB drivers that are provided with modern Windows®, Mac® and Linux® operating systems. Under most operating systems, the USB driver installation will be fully automatic. Under certain older operating systems, or if the device is attached to an older than Windows 10 machine without an active Internet connection, manual installation of the drivers may be necessary. In this case, the driver package can be downloaded from:

www.microchip.com/mcp2221a

Details on how to access the serial port from Mac and Linux operating systems can also be found in the associated collateral for the MCP2221A. Under Windows, after successful USB driver installation, the device will appear as a "COMx" port object, which standard serial terminal programs can open/read/write to and from.

© 2019 Microchip Technology Inc.

2.5 CIRCUIT DETAILS

This section highlights some of the circuit elements and provides an explanation for their intent and function.

2.5.1 Jumpers/Headers/Connectors

J1, J3 – These are populated 2x25-pin, 100 mil jumper headers, in which a power module or any other custom designed board may optionally be inserted to access the microcontroller's digital pins. Use the triangle alignment mark on J1, pin 1 (underneath VREF, see Figure 1-1) to connect the dsPIC33CK Curiosity Development Board to other boards.

J2, J4 – These are populated 2x25-pin, 100 mil jumper headers, in which a power module or any other custom designed board may optionally be inserted to access the microcontroller's analog and digital pins.

J5, J6 – These are female headers that implement the mikroBUS Interfaces A and B, which are used to attach hardware daughter boards to expand the functionality of the development board.

J7 – This is a standard female USB Micro-B connector, which connects to the MCP2221A USB-UART converter chip and the on-board MPLAB PKOB4 programmer/debugger. This USB interface has a data interface and supplies power to the rest of the board, as well as to the mikroBUS A and B, up to 400 mA.

J8 – This is an unpopulated 6-pin staggered header interface that can optionally be used to connect an external programmer/debugger to the target microcontroller, U1. The J8 header connects to the debug port, PGx3. The holes are slightly staggered, which provides some friction retention force without requiring physical soldering when a straight male-male or right-angle male-male header is installed into J8.

J9 – This is an unpopulated 2-pin, 100 mil jumper header, which may optionally be used to insert a current meter in series with the U1 VDD current path to measure the microcontroller's current consumption. In order to measure the U1 current, the trace (NT1) on the bottom of the PCB, that shorts the two pins of J1, should be cut and a 2-pin jumper should be soldered into J9.

J10, J12 – These are populated 2x2-pin, 100 mil jumper headers, which may optionally be used to insert GND_D of a power module or any other custom designed boards that access the microcontroller's analog and digital pins. Also, it has the purpose of a mechanical key that will prevent reverse connection.

2.5.2 User Interface (UI)

The dsPIC33CK Curiosity Board contains a User Interface (UI), easily accessible on the right side (see Figure 1-1). The UI has the following elements:

- One RGB LED
- A 10K Potentiometer
- Three Push Buttons
- Two Debug Orange LEDs

Each element can be programed for any purpose to create the desired interaction between the user and the board behavior.

2.5.3 ADC Op Amp Analog RC Section

The board contains three RC filter components for each individual ADC core of the microcontroller, U1. They are identical; the only difference is that one connects to the dedicated ADC Core 1, another to the dedicated ADC Core 0 and the third one to the shared ADC core.

The default configuration is the internal op amp variant, in which all passive components, R and C, are populated for the filter, feedback and bias circuits.

To use the external op amp, remove R59, R75 and R81 resistors and populate C24, C25 and C26 with 5600 pF, 50V, 0603, COG resistors to enable an RC filter of F_C = 506 kHz.

There is an on-board MCP6021 op amp to power the internal V_{REF} for the three op amps with 1.65V (V_{DD}/2) voltage reference.

V_{REF_EXT} can also be used from connector J2 by removing, R30, 75 Ohm, and moving it into the R31 place (default DNP).

The RC filters have a cutoff frequency:

EQUATION 2-1:

$$F_c = \frac{1}{2\pi RC}$$

where R is the resistance and C is the capacitor of the filter.

Example: R = 56 Ohms and C = 5600 pF, then F_C = 507509 [Hz] or 507 [kHz].

Rise/fall time, with a steady state of 10% to 90%, is proportional to the time constant: τ = RC.

EQUATION 2-2:

$$t_r = 2.197\tau$$

For example: R = 56 Ohms and C = 5600 pF, then t_r = 0.68 µs.

© 2019 Microchip Technology Inc.

Appendix A. Board Layout and Schematics

This appendix contains the pinout, the schematics and the board layouts for the dsPIC33CK Curiosity Board. The topics covered in this appendix include:

- Pinout
- dsPIC33CK Curiosity Development Board Schematics
- dsPIC33CK Curiosity Development Board PCB Layout

A.1 PINOUT

Table A-1 and Table A-2 show the pinout and the electrical parameters for connectors, J1 and J2, respectively.

TABLE A-1: PINOUT AND ELECTRICAL PARAMETERS, J1

Name	J1	dsPIC® DSC Pin	Function/Description	Remark
VREF_EXT	1	NC	—	—
+3.3V	2	12, 31, 51, 71	dsPIC DSC VDD Supply	Output Limit 50 mA
NC	3	NC	—	—
GND_A	4	26	Analog Ground	—
AN12_RP48	5	15	Analog Input	—
IA_AN0_OA1OUT	6	16	Analog Input, 56R, Cap = DNP	FC = 507 kHz, t_r = 0.68 µs
IB_AN1_OA2OUT	7	41	Analog Input, 56R, Cap = DNP	FC = 507 kHz, t_r = 0.68 µs
S_ANA1_OA2IN-	8	18	Analog Input	2 kΩ in series
S_AN8_OA2IN-	9	43	Analog Input	2 kΩ in series
S_AN9_OA1IN+	10	20	Analog Input	2 kΩ in series
S_RB4_OA2IN+	11	45	Analog Input	2 kΩ in series
AN17_RP54	12	30	Analog Input	—
AN2_CMP3A	13	58	Analog Input	Comparator 3
IBUS_AN4_OA3OUT	14	23	Analog Input, 56R Cap = DNP	FC = 507 kHz, t_r = 0.68 µs
AN10_PGD1	15	60	Analog Input	—
S_AN13_OA3IN-	16	28	Analog Input	2 kΩ in series
AN15_CMP2A	17	33	Analog Input	Comparator 2
S_AN14_OA3IN+	18	29	Analog Input	2 kΩ in series
AN18_CMP3C	19	38	Analog Input	Comparator 3
AN3_DACOUT1	20	21	Analog Input	DAC output
AN20_RE0	21	2	MikroA Analog Pin	—
AN6_RP33	22	35	Analog Input	—
AN22_RE2	23	17	MikroB Analog Pin	—
AN11_PGC1	24	61	MikroA Reset	—
RP77_ANN2	25	14	Analog Input	—
AN16_RP55	26	40	Temp. Input, RC Filtered	FC = 159 Hz, t_r = 2.1 ms
NC	27	NC	Not Connected	Reserved for future use
AN19_CMP2C	28	36	Analog Input	Comparator 2

TABLE A-1: PINOUT AND ELECTRICAL PARAMETERS, J1 (CONTINUED)

Name	J1	dsPIC® DSC Pin	Function/Description	Remark
NC	29	NC	Not Connected	Reserved for future use
AN21_RE1	30	4	VBUS Input, RC Filtered	FC = 1.4 kHz, t_r = 24 µs
NC	31	NC	Not Connected	Reserved for future use
AN23_RE3	32	19	Pot. Input, RC Filtered	FC = 4.8 kHz, t_r = 72 µs
NC	33	—	Not Connected	Reserved for future use
NC	34	—	Not Connected	Reserved for future use
NC	35	—	Not Connected	Reserved for future use
NC	36	—	Not Connected	Reserved for future use
NC	37	—	Not Connected	Reserved for future use
NC	38	—	Not Connected	Reserved for future use
NC	39	—	Not Connected	Reserved for future use
NC	40	—	Not Connected	Reserved for future use
NC	41	—	Not Connected	Reserved for future use
ASCL1_RP57	42	47	mikroBUS™ I^2C, SCL	Parallel MikroA, MikroB
ASDA1_RP56	43	46	mikroBUS I^2C, SDA	Parallel MikroA, MikroB
NC	44	NC	Not Connected	Reserved for future use
NC	45	NC	Not Connected	Reserved for future use
SCL2_PGC3	46	56	Program/Debug	PGC
SDA2_PGD3	47	55	Program/Debug	PGD
$\overline{MCLR}$	48	9	Device Reset	0R series resistance
GND_D	49	11, 32, 50, 70	Digital Ground	—
GND_D	50	11, 32, 50, 70	Digital Ground	—

TABLE A-2: PINOUT AND ELECTRICAL PARAMETERS, J2

Name	J2	dsPIC® DSC Pin	Function/Description	Remark
RP47_PWM1L	1	3	PWM Output	75R series resistance
RP46_PWM1H	2	1	PWM Output	75R series resistance
RP45_PWM2L	3	80	PWM Output	75R series resistance
RP44_PWM2H	4	78	PWM Output	75R series resistance
RP43_PWM3L	5	76	PWM Output	75R series resistance
RP42_PWM3H	6	75	PWM Output	75R series resistance
RP64_PWM4L	7	74	PWM Output	75R series resistance
RP65_PWM4H	8	73	PWM Output	75R series resistance
RP53_PWM5L	9	65	PWM Output	75R series resistance
RP52_PWM5H	10	63	PWM Output	75R series resistance
RP63_PWM6L	11	8	PWM Output	75R series resistance
RP62_PWM6H	12	7	PWM Output	75R series resistance
RP59_PWM7L	13	67	PWM Output	75R series resistance
RP58_PWM7H	14	66	PWM Output	75R series resistance
RP61_PWM8L	15	6	PWM Output	75R series resistance
RP60_PWM8H	16	5	PWM Output	75R series resistance
NC	17	—	Not Connected	Reserved for future use
NC	18	—	Not Connected	Reserved for future use
NC	19	—	Not Connected	Reserved for future use

© 2019 Microchip Technology Inc.

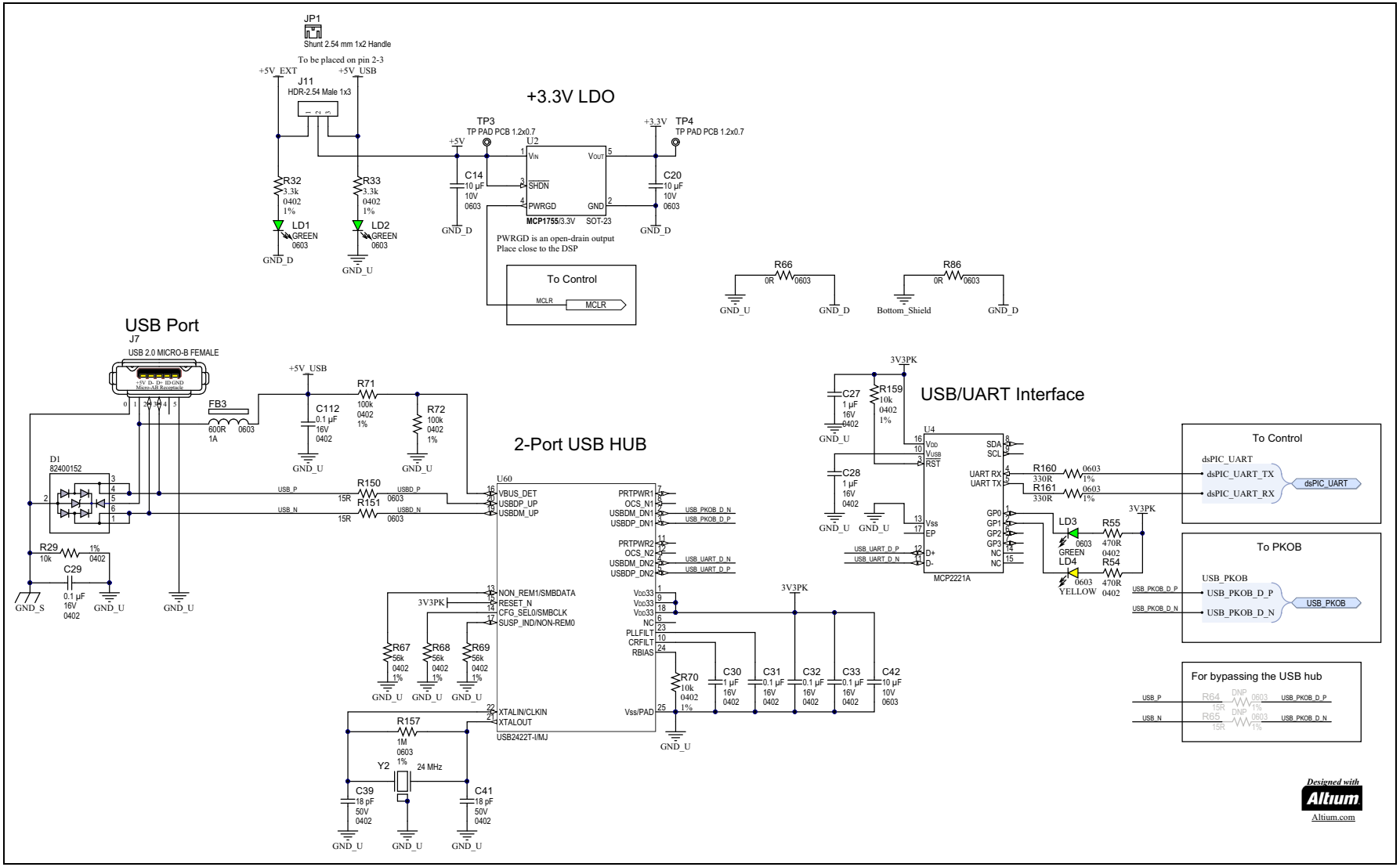
TABLE A-2: PINOUT AND ELECTRICAL PARAMETERS, J2 (CONTINUED)

Name	J2	dsPIC® DSC Pin	Function/Description	Remark
NC	20	—	Not Connected	Reserved for future use
NC	21	—	Not Connected	Reserved for future use
NC	22	—	Not Connected	Reserved for future use
NC	23	—	Not Connected	Reserved for future use
RE15_RGB_R	24	79	RGB LED Red	—
RP79_RD15	25	10	MikroA UART RX	—
RE14_RGB_G	26	77	RGB LED Green	—
RP78_RD14	27	13	MikroA UART TX	—
RE13_RGB_B	28	64	RGB LED Blue	—
RP76_RD12	29	27	MikroB UART RX	100Ω in series
RE12_MikroB_INT	30	62	MikroB Interrupt	1 kΩ in series
RP73_RD9	31	48	MikroB UART TX	—
RE11_MikroA_INT	32	59	MikroA Interrupt	1 kΩ in series
RP72_RD8	33	49	mikroBUS™ SPI SCK	Parallel MikroA, MikroB
RE10_MikroB_CS	34	57	MikroB CS Chip Select	—
RP71_RD7	35	52	mikroBUS SPI MISO	Parallel MikroA, MikroB
RE9_S3	36	44	User Switch S3	—
RP70_RD6	37	53	mikroBUS SPI MOSI	Parallel MikroA, MikroB
RE8_S2	38	42	User Switch S2	—
RP69_RD5	39	54	Digital General Purpose	—
RE7_S1	40	39	User Switch S1	—
RP68_RD4_UART_TX	41	68	UART Transmit MCP2221A	—
RE6_LED1	42	37	Debug LED1	—
RP67_RD3_UART_RX	43	69	UART Receive MCP2221A	—
RE5_LED2	44	24	Debug LED2	—
RP66_RD2_MikroA_CS	45	72	MikroA CS Chip Select	—
RE4	46	22	MikroB Reset	—
+5V_EXT	47	—	Input External Power	Selectable via J11
+5V_EXT	48	—	Input External Power	Selectable via J11
GND_D	49	11, 32, 50, 70	Digital Ground	—
GND_D	50	11, 32, 50, 70	Digital Ground	—

A.2 dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS

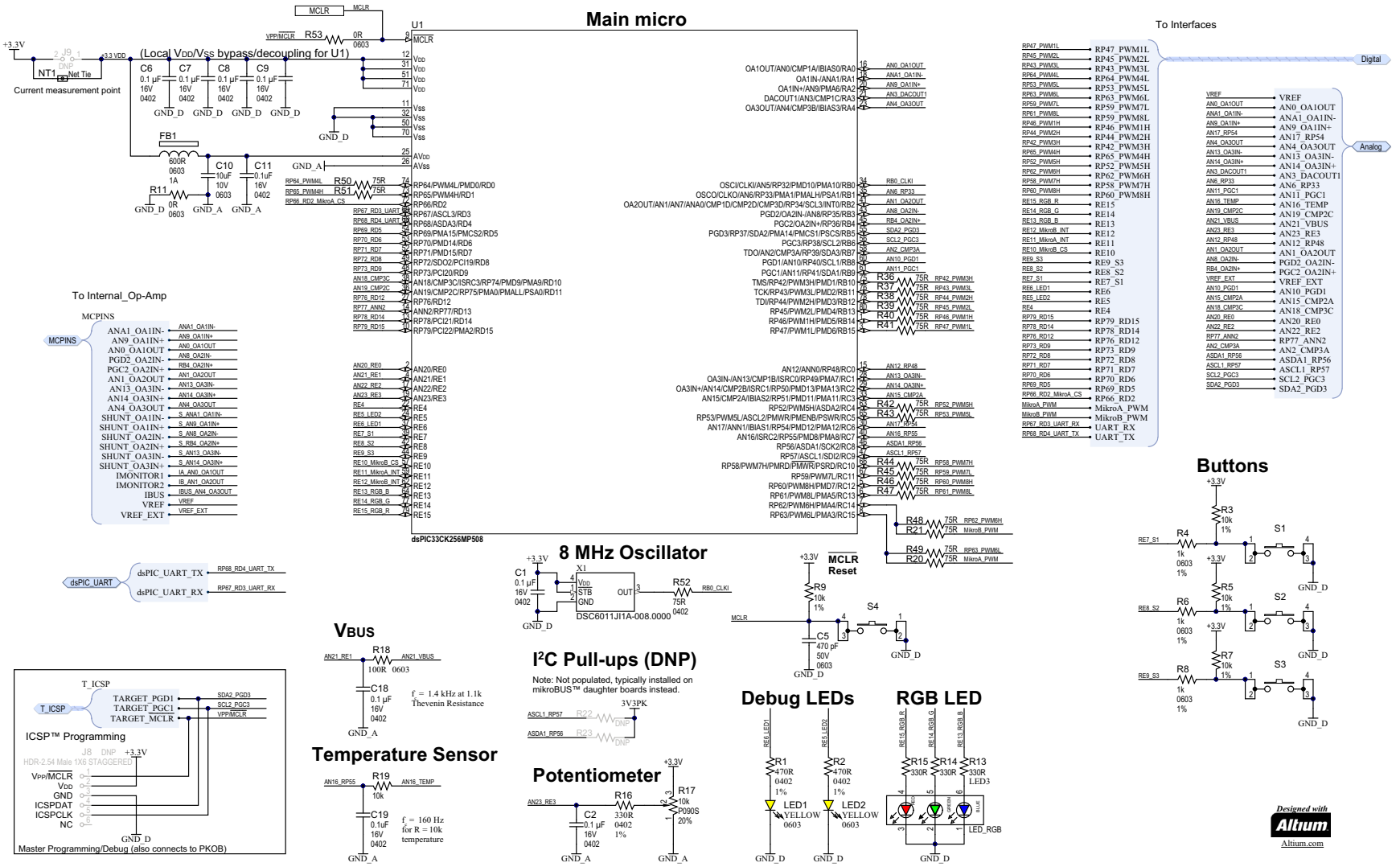
Figure A-1 through Figure A-8 show the board schematics.

FIGURE A-1: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 1 OF 8)



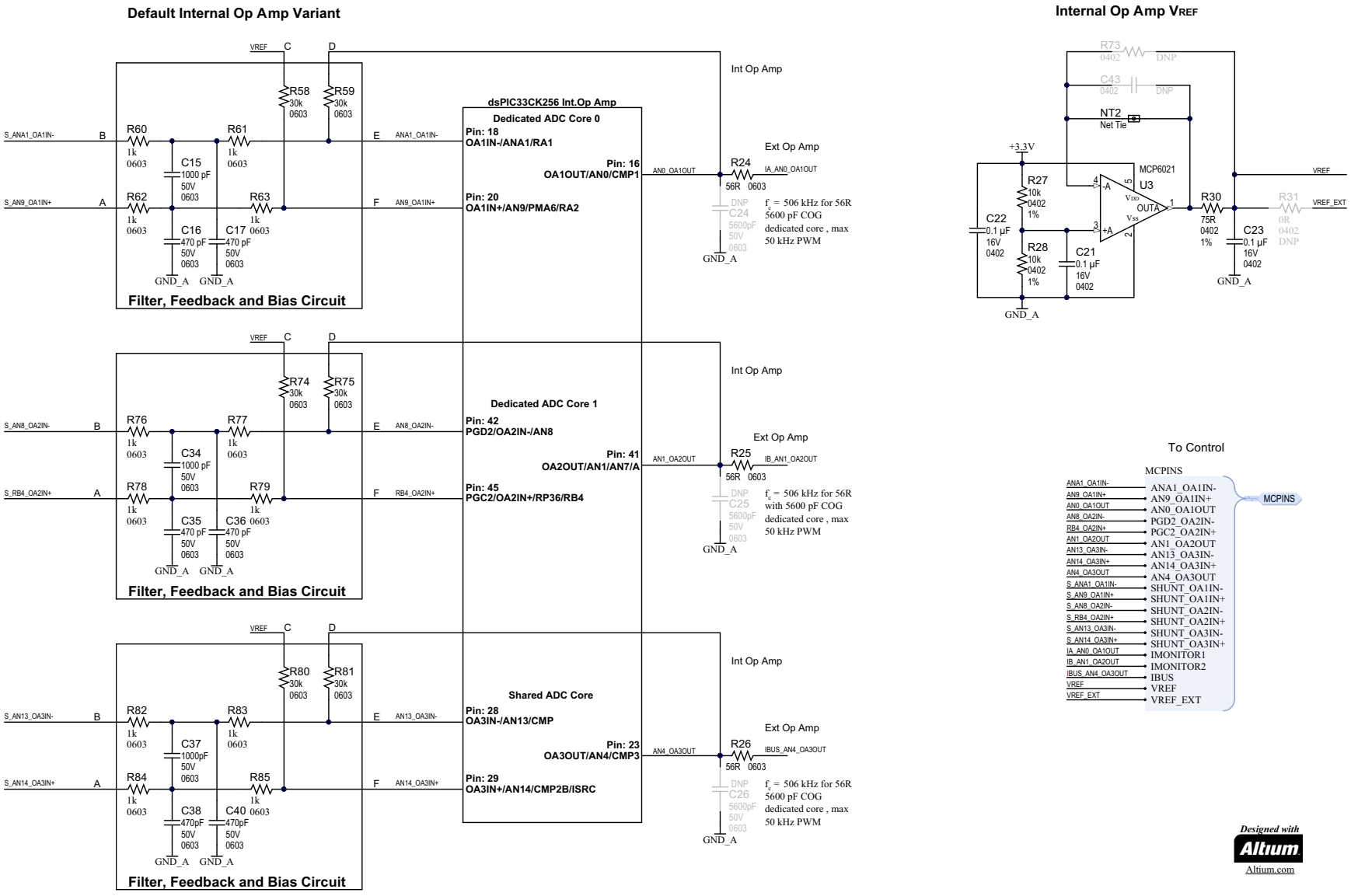
© 2019 Microchip Technology Inc.

FIGURE A-2: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 2 OF 8)



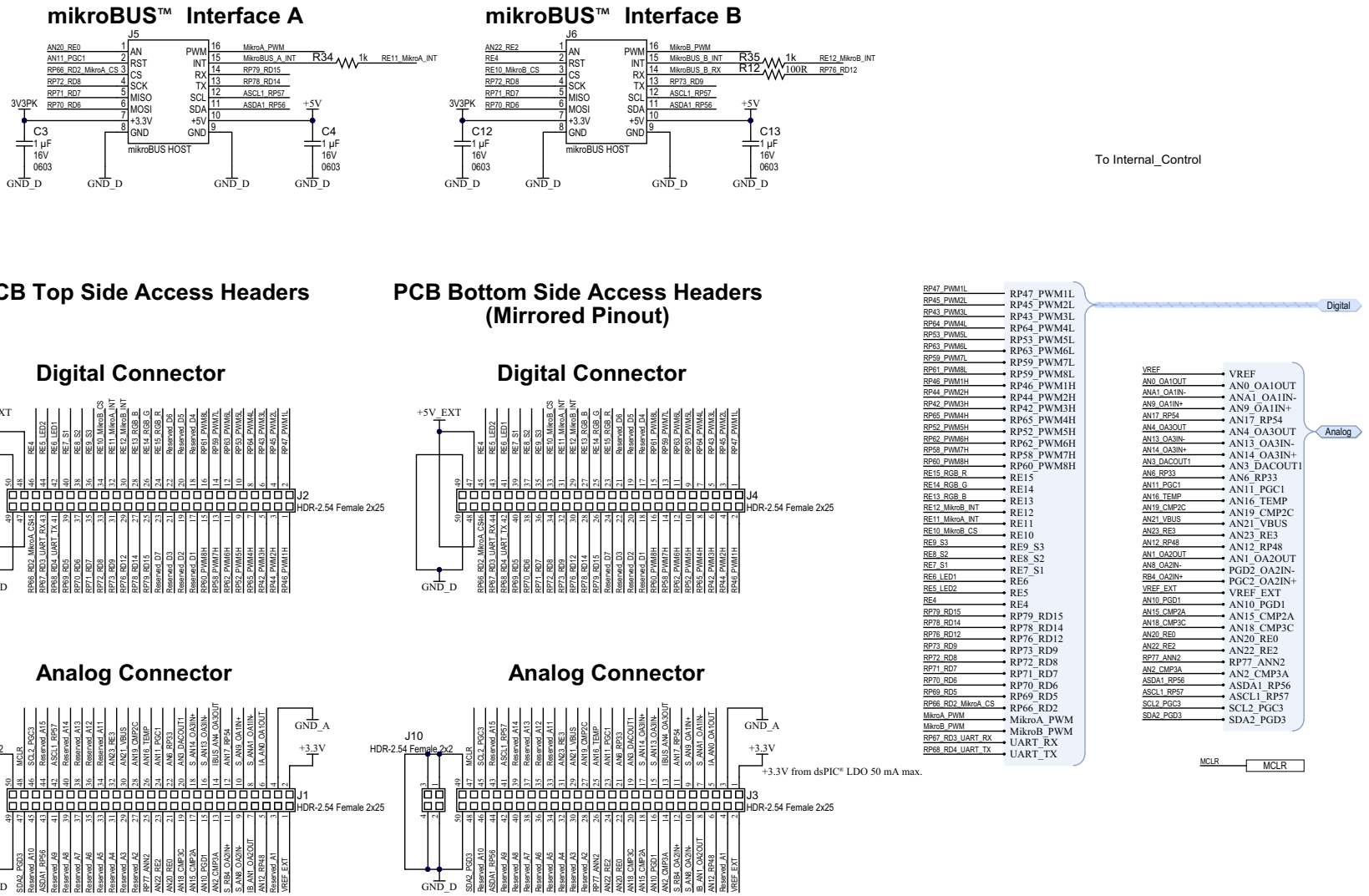
© 2019 Microchip Technology Inc.

FIGURE A-3: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 3 OF 8)



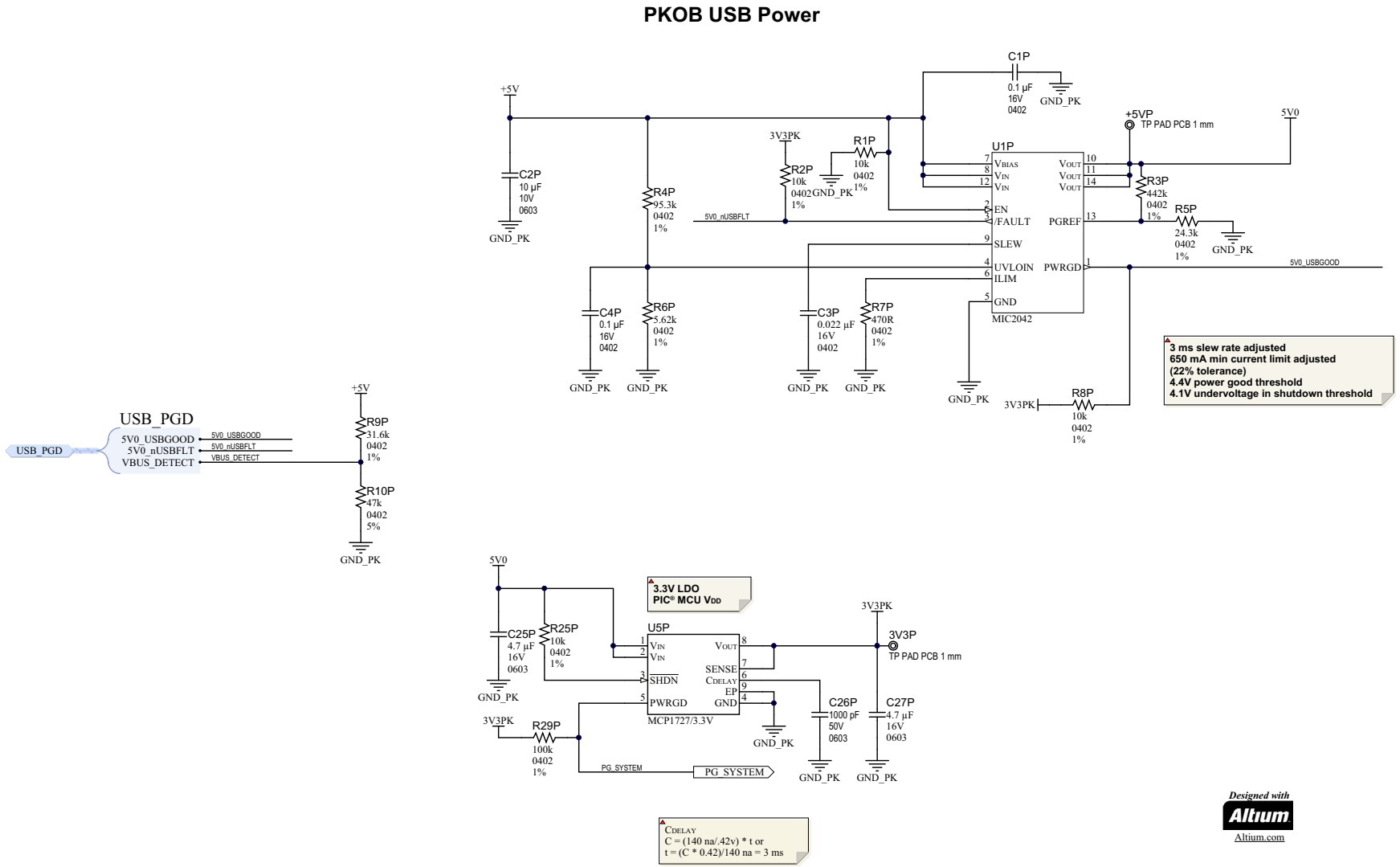
© 2019 Microchip Technology Inc.

FIGURE A-4: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 4 OF 8)



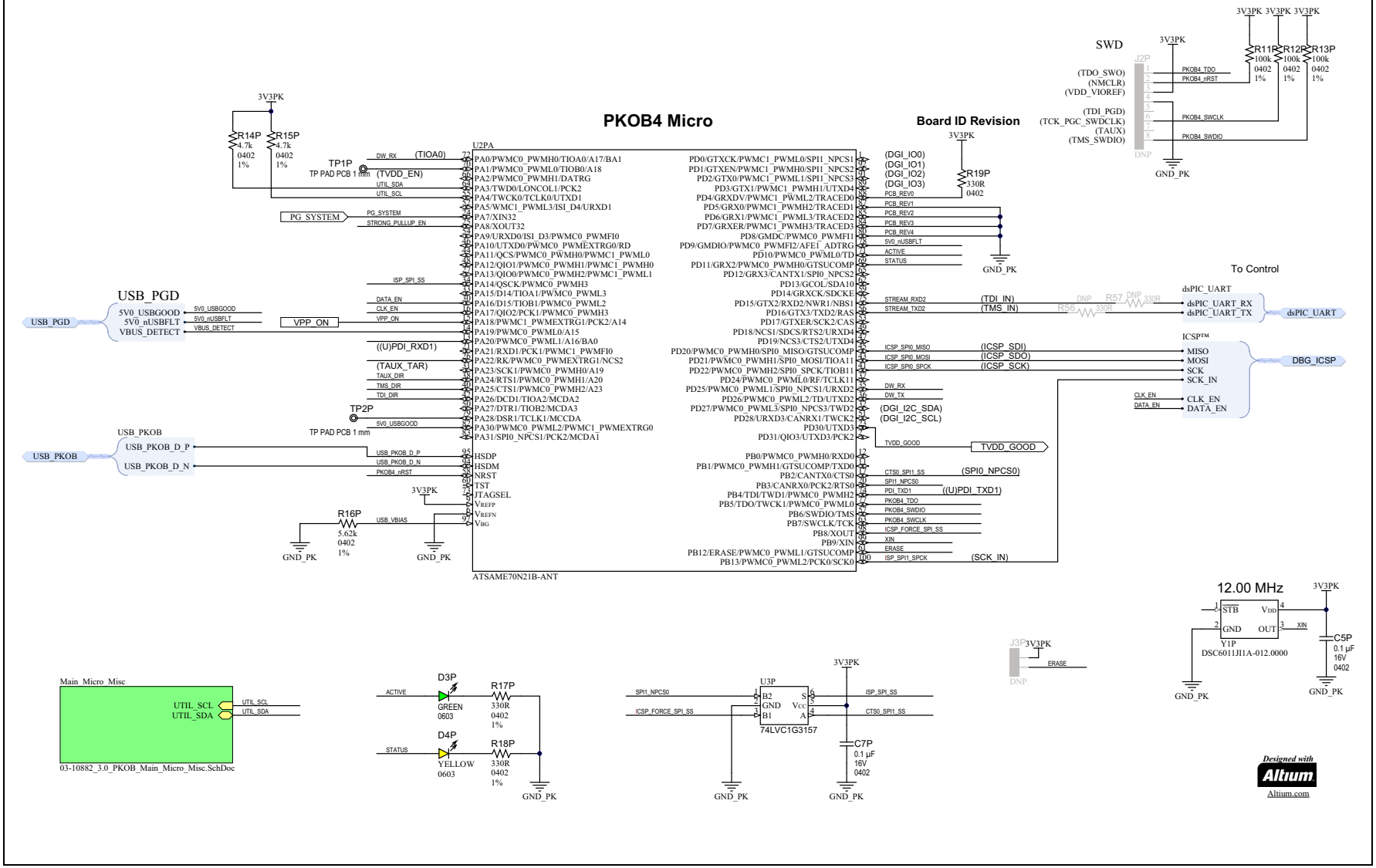
© 2019 Microchip Technology Inc.

FIGURE A-5: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 5 OF 8)



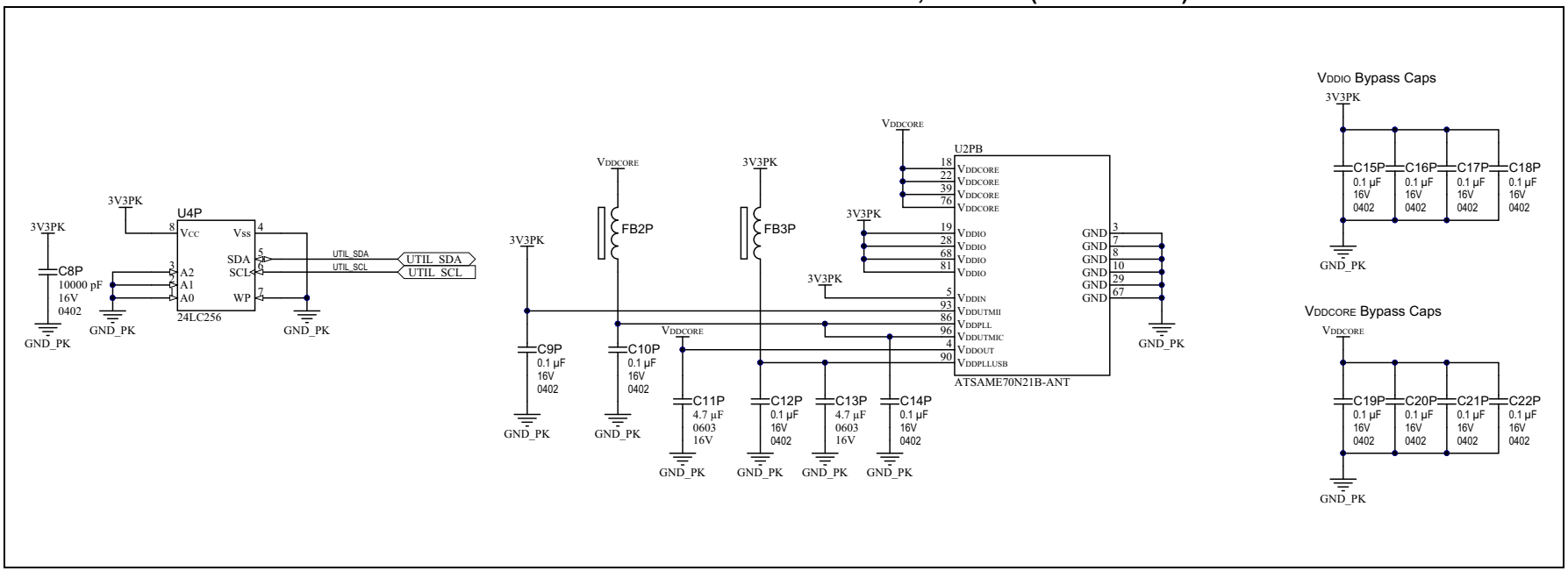
© 2019 Microchip Technology Inc.

FIGURE A-6: dsPICC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 6 OF 8)



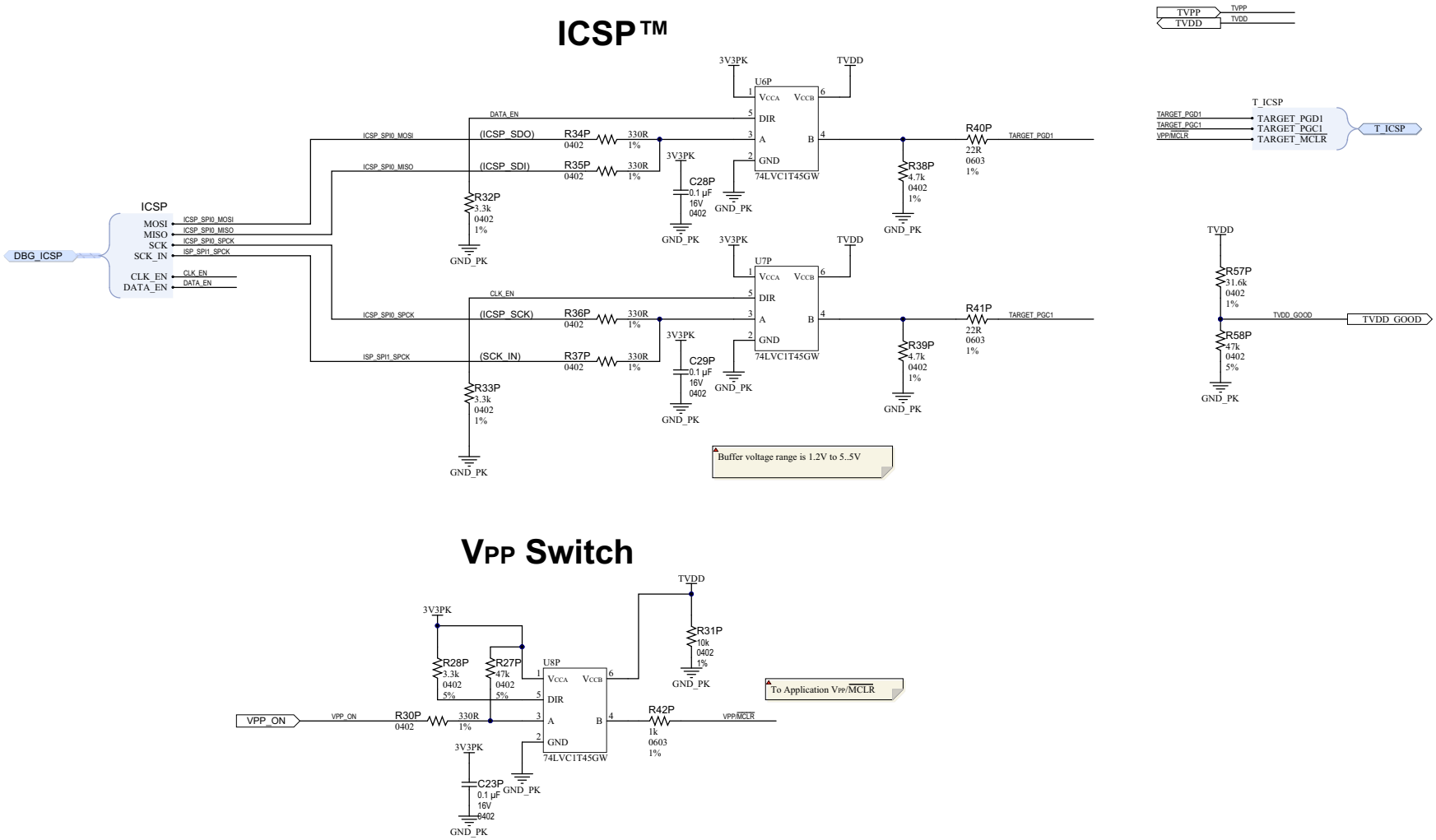
© 2019 Microchip Technology Inc.

FIGURE A-7: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 7 OF 8)



© 2019 Microchip Technology Inc.

FIGURE A-8: dsPIC33CK CURIOSITY DEVELOPMENT BOARD SCHEMATICS, REV. 2.0 (PAGE 8 OF 8)



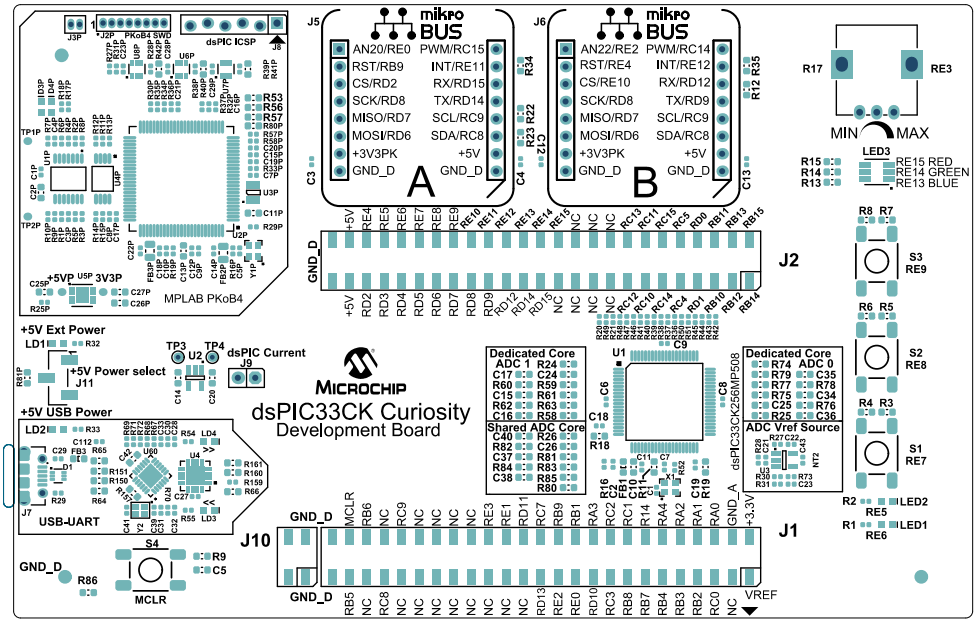
© 2019 Microchip Technology Inc.

A.3 dsPIC33CK CURIOSITY DEVELOPMENT BOARD PCB LAYOUT

The dsPIC33CK Curiosity Board is a four-layer FR4, 1.6 mm, Plated-Through-Hole (PTH) PCB construction. Figure A-9 through Figure A-10 illustrate the PCB layers.

FIGURE A-9: dsPIC33CK CURIOSITY DEVELOPMENT BOARD TOP SILKSCREEN AND TOP COPPER

Top Silkscreen



Top Copper

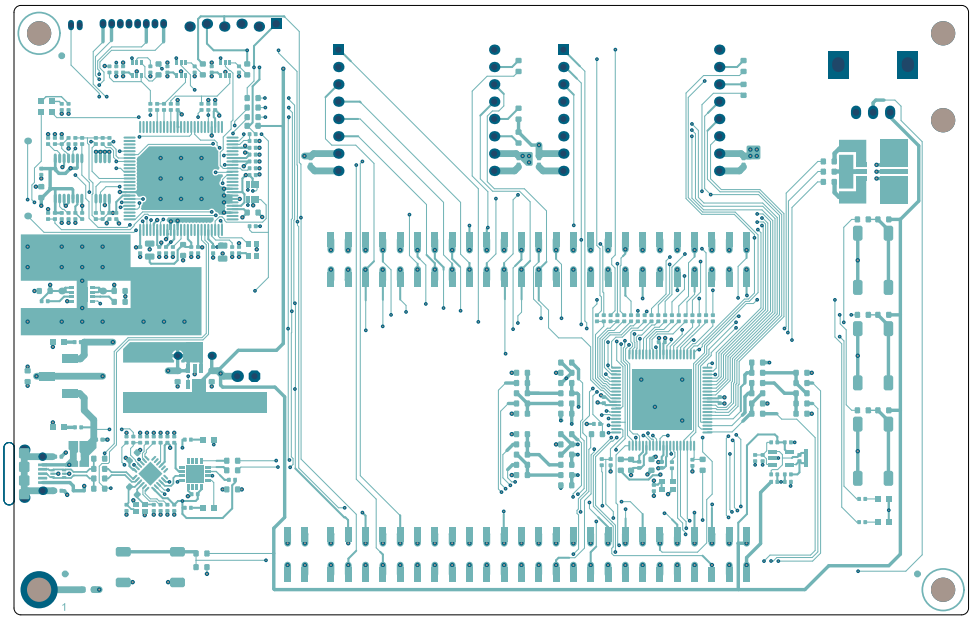
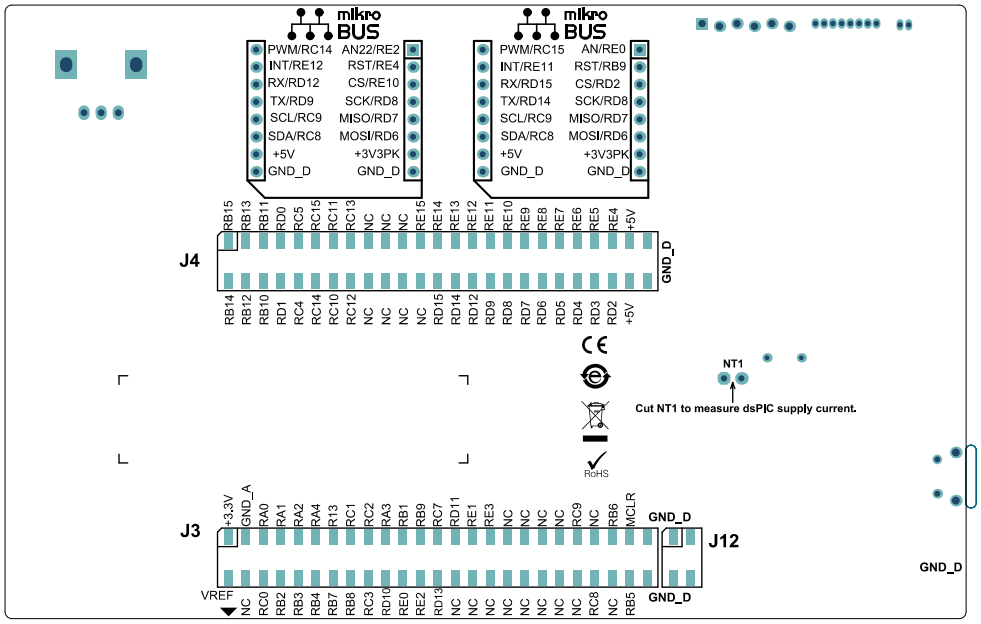
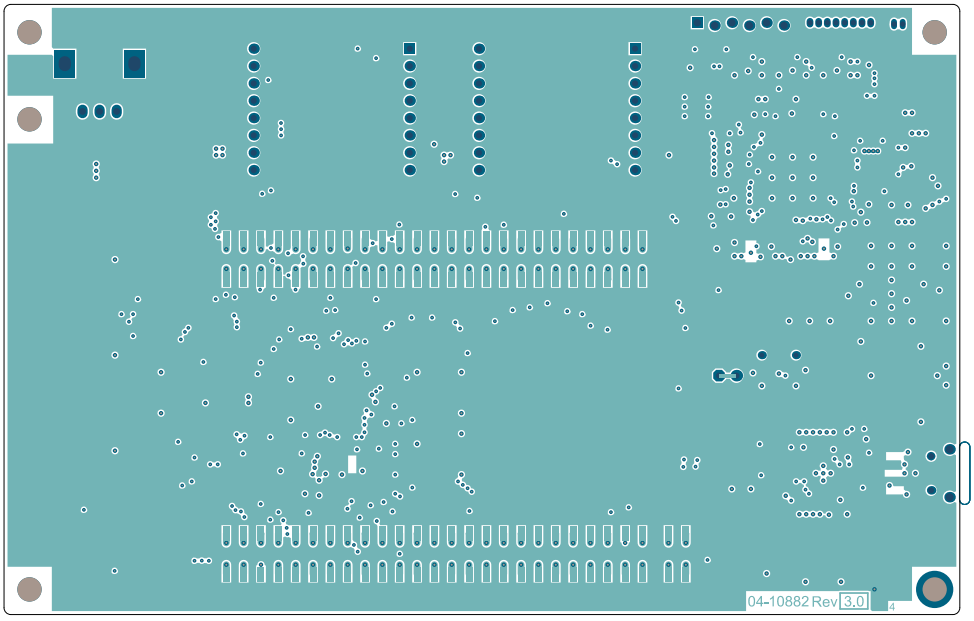


FIGURE A-10: dsPIC33CK CURIOSITY DEVELOPMENT BOARD BOTTOM SILKSCREEN AND BOTTOM COPPER

Bottom Silkscreen



Bottom Copper



NOTES:

© 2019 Microchip Technology Inc.

Appendix B. Bill of Materials (BOM)

This appendix contains the Bill of Materials (BOMs) for the dsPIC33CK Curiosity Development Board.

- Bill of Materials – dsPIC33CK Curiosity Development Board

B.1 BILL OF MATERIALS – dsPIC33CK CURIOSITY DEVELOPMENT BOARD

Table B-1 shows the Bill of Materials for the dsPIC33CK Curiosity Board.

TABLE B-1: dsPIC33CK CURIOSITY DEVELOPMENT BOARD BOM

Qty	Designator	Description_	Manufacturer	Manufacturer Part Number
37	C1, C1P, C2, C4P, C5P, C6, C7, C7P, C8, C8P, C9, C9P, C10P, C11, C12P, C14P, C15P, C16P, C17P, C18, C18P, C19, C19P, C20P, C21, C21P, C22, C22P, C23, C23P, C28P, C29, C29P, C31, C32, C33, C112	Capacitor, Ceramic, 0.1 µF, 16V, 10%, X7R, SMD, 0402	Murata Electronics®	GRM155R71C104KA88D
4	C11P, C13P, C25P, C27P	Capacitor, Ceramic, 4.7 µF, 16V, 10%, X5R, SMD, 0603	TDK Corporation	C1608X5R1C475K080AC
4	C15, C26P, C34, C37	Capacitor, Ceramic, 1000 pF, 50V, 20%, X7R, SMD, 0603	KEMET	C0603C102M5RACTU
5	C2P, C10, C14, C20, C42	Capacitor, Ceramic, 10 µF, 10V, 20%, X5R, SMD, 0603	Samsung Group	CL10A106MP8NNNC
7	C3, C4, C12, C13, C27, C28, C30	Capacitor, Ceramic, 1 µF, 16V, 10%, X5R, SMD, 0402	Murata Electronics	GRM155R61C105KE01D
2	C39, C41	Capacitor, Ceramic, 18 pF, 50V, 5%, C0G, SMD, 0402	Murata Electronics	GRM1555C1H180JA01D
1	C3P	Capacitor, Ceramic, 0.022 µF, 16V, 10%, X7R, SMD, 0402	Samsung Group	CL05B223KO5NNNC
7	C5, C16, C17, C35, C36, C38, C40	Capacitor, Ceramic, 470 pF, 50V, 10%, X7R, SMD, 0603	Johanson Dielectrics	500R14W471KV4T
1	D1	Diode, TVS Array, 82400152, 5V, USB 2.0, SMD, SOT-563	Wurth Elektronik	82400152
4	D3P, LD1, LD2, LD3	Diode LED Green, 2V, 30 mA, 35 mcd, Clear, SMD, 0603	Lite-On®, Inc.	LTST-C190KGKT
4	D4P, LD4, LED1, LED2	Diode LED Yellow, 2.1V, 20 mA, 6 mcd, Clear, SMD, 0603	Lite-On, Inc.	LTST-C190YKT
2	FB1, FB3	Ferrite, 600R at 100 MHz, 1A, SMD, 0603	Bourns®, Inc.	MH1608-601Y
2	FB2P, FB3P	Ferrite, 2A, 600R, SMD, 0805	TDK Corporation	MPZ2012S601AT000

TABLE B-1: dsPIC33CK CURIOSITY DEVELOPMENT BOARD BOM (CONTINUED)

Qty	Designator	Description_	Manufacturer	Manufacturer Part Number
4	J1, J2, J3, J4	Connector, Header-2.54, Female, 2x25, Gold, 8.75 mm, SMD, Vertical	4UCON Technology Inc.	21382
2	J10, J12	Connector, Header-2.54, Female, 2x2, Gold, 8.75 mm, SMD, Vertical	4UCON Technology Inc.	20943
1	J11	Connector, Header-2.54, Male, 1x3, Gold, 5.8 mm, SMD, Vertical	Harwin Plc.	M20-8770342
4	J5, J6	Socket, microBUS™, Host, DIP, 16, TH	Sullins Connector Solutions	PPTC081LFBN-RC
1	J7	Connector, USB 2.0 Micro-B, Female, TH/SMD, R/A	FCI	10118194-0001LF
1	LED3	Diode, LED Tri Red, Green, Blue, 2.1V, 3.0V, 3.2V, 50 mA, 35 mA, 35 mA, SMD, 6-PLCC	Cree, Inc.	CLX6D-FKB-CMPQS-GKBB7A363
5	R1, R2, R7P, R54, R55	Resistor, TKF, 470R, 1%, 1/16W, MF, 0402	Yageo Corporation	RC0402FR-07470RL
3	R10P, R27P, R58P	Resistor, TKF, 47k, 5%, 1/10W, SMD, 0402	Panasonic® - ECG	ERJ-2GEJ473X
6	R11, R53, R66, R80P, R81P, R86	Resistor, TKF, 0R, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3GSY0R00V
6	R11P, R12P, R13P, R29P, R71, R72	Resistor, TKF, 100k, 1%, 1/10W, SMD, 0402	Panasonic - ECG	ERJ-2RKF1003X
2	R12, R18	Resistor, TKF, 100R, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1000V
5	R13, R14, R15, R160, R161	Resistor, TKF, 330R, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF3300V
4	R14P, R15P, R38P, R39P	Resistor, TKF, 4.7k, 1%, 1/16W, SMD, 0402	Yageo Corporation	RC0402FR-074K7L
2	R150, R151	Resistor, TKF, 15R, 1%, 1/16W, SMD, 0603	Stackpole Electronics, Inc.	RMCF0603FT15R0
1	R157	Resistor, TKF, 1M, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1004V
9	R16, R17P, R18P, R19P, R30P, R34P, R35P, R36P, R37P	Resistor, TKF, 330R, 1%, 1/16W, SMD, 0402	Yageo Corporation	RC0402FR-07330RL
1	R17	Resistor, Variable, 10K, 20%, TH, P090S	TT Electronics Plc.	P090S-14T20BR10K
10	R1P, R2P, R8P, R25P, R27, R28, R29, R31P, R70, R159	Resistor, TKF, 10k, 1%, 1/10W, SMD, 0402	Panasonic - ECG	ERJ-2RKF1002X
20	R20, R21, R30, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52	Resistor, TKF, 75R, 1%, 1/16W, SMD, 0402	Yageo Corporation	RC0402FR-0775RL
3	R24, R25, R26	Resistor, TKF, 56R, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF56R0V

© 2019 Microchip Technology Inc.

TABLE B-1: dsPIC33CK CURIOSITY DEVELOPMENT BOARD BOM (CONTINUED)

Qty	Designator	Description_	Manufacturer	Manufacturer Part Number
5	R28P, R32, R32P, R33, R33P	Resistor, TKF, 3.3k, 1%, 1/10W, SMD, 0402	Panasonic® - ECG	ERJ-2RKF3301X
5	R3, R5, R7, R9, R19	Resistor, TKF, 10k, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1002V
1	R3P	Resistor, TKF, 442k, 1%, 1/16W, SMD, 0402	Samsung Group	RC1005F4423CS
18	R4, R6, R8, R34, R35, R42P, R60, R61, R62, R63, R76, R77, R78, R79, R82, R83, R84, R85	Resistor, TKF, 1k, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF1001V
2	R40P, R41P	Resistor, TKF, 22 Ohm, 1%, 1/10W, SMD, 0603	Yageo Corporation	RC0603FR-0722RL
1	R4P	Resistor, TKF, 95.3k, 1%, 1/16W, SMD, 0402	ROHM Semiconductor	MCR01MRTF9532
6	R58, R59, R74, R75, R80, R81	Resistor, TKF, 30k, 1%, 1/10W, SMD, 0603	Stackpole Electronics, Inc.	RMCF0603FT30K0
1	R5P	Resistor, TKF, 24.3k, 1%, 1/16W, SMD, 0402	Samsung Group	RC1005F2432CS
3	R67, R68, R69	Resistor, TKF, 56k, 1%, 1/16W, SMD 0402	ROHM Semiconductor	MCR01MZPF5602
2	R6P, R16P	Resistor TKF, 5.62k, 1%, 1/16W, SMD, 0402	Vishay Intertechnology, Inc.	CRCW04025K62FKED
2	R9P, R57P	Resistor, TKF, 31.6k, 1%, 1/10W, SMD, 0402	Panasonic - ECG	ERJ-2RKF3162X
4	S1, S2, S3, S4	Switch. Tact., SPST, 12V, 50 mA, PTS645SM43SMTR92, LFS, SMD	Wurth Elektronik	430182043816
1	U3P	IC, Switch, SPDT, 74LVC1G3157, SC-70-6	Texas Instruments	SN74LVC1G3157DCKR
3	U6P, U7P, U8P	IC Transceiver, 74LVC1T45GW, Single Bit Voltage Translator, SOT-363	NXP Semiconductors	74LVC1T45GW,125
1	Y2	Crystal, 24 MHz, 6 pF, SMD, L2.0W1.6H0.7	Murata Electronics®	XRCGB24M000F0L00R0
1	U2	Microchip Analog LDO, 3.3V, MCP1755T-3302E/OT, SOT-23-5	Microchip Technology Inc.	MCP1755T-3302E/OT
1	U5P	Microchip Analog LDO, 3.3V, MCP1727T-3302E/MF, DFN-8	Microchip Technology Inc.	MCP1727T-3302E/MF
1	U3	Microchip Analog Op Amp, 1-Ch, 10 MHz, MCP6021T-E/OT, SOT-23-5	Microchip Technology Inc.	MCP6021T-E/OT
1	U1P	Microchip Analog Power Switch, 5.5V, 3A, MIC2042-1YTS, TSSOP-14	Microchip Technology Inc.	MIC2042-1YTS
1	Y1P	Microchip Clock Oscillator, Single, 12.000 MHz, DSC6011JI1A-012.0000, VLGA	Microchip Technology Inc.	DSC6011JI1A-012.0000

TABLE B-1: dsPIC33CK CURIOSITY DEVELOPMENT BOARD BOM (CONTINUED)

Qty	Designator	Description_	Manufacturer	Manufacturer Part Number
1	X1	Microchip Clock Oscillator, Single, 8.000 MHz, DSC6011JI1A-008.0000, VDFN-4	Microchip Technology Inc.	DSC6011JI1A-008.0000
1	U60	Microchip Interface USB 2.0, High Speed, 2 Port HUB Controller, QFN-24	Microchip Technology Inc.	USB2422T-I/MJ
1	U4	Microchip Interface, USB, I^2C/UART, MCP2221A-I/ML, QFN-16	Microchip Technology Inc.	MCP2221A-I/ML
1	U1	Microchip MCU, 16-Bit, 256 Kbyte Flash, 24 Kbyte, dsPIC33CK256MP508-I/PT, TQFP-80	Microchip Technology Inc.	dsPIC33CK256MP508 I/PT
1	U2P	Microchip MCU, 32-Bit, 300 MHz, 2 Mbyte, 384 Kbyte, ATSAME70N21B-ANT, LQFP-100	Microchip Technology Inc.	ATSAME70N21B-ANT
1	U4P	Microchip Memory Serial EEPROM, 256k, I^2C, 24LC256T-E/ST, TSSOP-8	Microchip Technology Inc.	24LC256T-E/ST

© 2019 Microchip Technology Inc.

NOTES:

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

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
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

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

China - Beijing
Tel: 86-10-8569-7000

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

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

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

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

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

China - Shanghai
Tel: 86-21-3326-8000

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

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

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

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

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

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

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

India - Pune
Tel: 91-20-4121-0141

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

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

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

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

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

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

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

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

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

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

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

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

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

Finland - Espoo
Tel: 358-9-4520-820

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

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-67-3636

Germany - Karlsruhe
Tel: 49-721-625370

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

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

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

Italy - Padova
Tel: 39-049-7625286

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

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

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

Sweden - Gothenberg
Tel: 46-31-704-60-40

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

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

© 2019 Microchip Technology Inc.