chanhvinh.com



PIC32MX470 Curiosity Development Board User's Guide

© 2016 Microchip Technology Inc.

chanhvinh.com

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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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, dsPIC, FlashFlex, flexPWR, Heldo, JukeBlox, KeeLoq, KeeLoq logo, Kleer, LANCheck, LINK MD, MediaLB, MOST, MOST logo, MPLAB, OptoLyzer, PIC, PICSTART, PIC32 logo, RightTouch, SpyNIC, SST, SST Logo, SuperFlash and UNI/O 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.

Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, JitterBlocker, KleerNet, KleerNet logo, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PureSilicon, RightTouch logo, REAL ICE, Ripple Blocker, Serial Quad I/O, 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 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.

© 2016, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-0871-0

© 2016 Microchip Technology Inc.

chanhvinh.com

Object of Declaration:

PIC32MX470 Curiosity Development Board (DM320103)

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

For information regarding the exclusive, limited warranties applicable to Microchip products, please see Microchip's standard terms and conditions of sale, which are printed on our sales documentation and available at www.microchip.com.

Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson
VP Development Tools

12-Sep-14
Date

chanhvinh.com

NOTES:

chanhvinh.com

© 2016 Microchip Technology Inc.

chanhvinh.com

PIC32MX470 CURIOSITY DEVELOPMENT BOARD USER'S GUIDE

Table of Contents

Preface **7**

Chapter 1. Introduction

1.1 Kit Contents 13

1.2 Development Board Functionality and Features 14

Chapter 2. Hardware

2.1 Hardware Features 17

Appendix A. Schematics

A.1 Block Diagram 23

A.2 Schematics 24

Appendix B. Bill of Materials

B.1 PIC32MX470 Curiosity Development Board Bill of Materials 27

Worldwide Sales and Service **30**

© 2016 Microchip Technology Inc.

chanhvinh.com

NOTES:

chanhvinh.com

© 2016 Microchip Technology Inc.

chanhvinh.com

PIC32MX470 CURIOSITY DEVELOPMENT BOARD USER'S GUIDE

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 PIC32MX470 Curiosity Development Board. 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 PIC32MX470 Curiosity Development Board 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 development board, highlighting its features and uses.
- **Chapter 2. "Hardware"** provides the hardware descriptions of the development board.
- **Appendix A. "Schematics"** provides a block diagram, board layouts, and detailed schematics of the development board.
- **Appendix B. "Bill of Materials"** provides the bill of materials for the components used in the design and manufacture of the development board.

chanhvinh.com

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Italic characters	Referenced books	*MPLAB X 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
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'`
`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) { ... }`
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.

© 2016 Microchip Technology Inc.

chanhvinh.com

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.

PIC32MX330/350/370/430/450/470 Family Data Sheet (DS60001185)

Refer to this document for detailed information on PIC32MX330/350/370/430/450/470 family 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.

mikroBUS™ Specification

The purpose of mikroBUS™ is to enable easy hardware expandability with a large number of standardized compact add-on boards. See their web site at: http://www.mikroe.com/mikrobus/.

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

chanhvinh.com

chanhvinh.com

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.

© 2016 Microchip Technology Inc.

chanhvinh.com

DOCUMENT REVISION HISTORY

Revision A (September 2016)

This is the initial released version of this user's guide.

chanhvinh.com chanhvinh.com chanhvinh.com chanhvinh.com chanhvinh.com chanhvinh.com

chanhvinh.com

NOTES:

chanhvinh.com

© 2016 Microchip Technology Inc.

chanhvinh.com

Chapter 1. Introduction

Thank you for purchasing a Microchip Technology PIC32MX470 Curiosity Development Board.

The PIC32MX470 Curiosity Development Board includes an integrated programmer/debugger and requires no additional hardware to get started. Users can expand functionality through MikroElectronika mikroBUS™ Click™ adapter boards, add Bluetooth® connectivity with the Microchip BM64 Bluetooth Audio module, and add audio input/output capability with Microchip audio daughter boards.

With or without expansion boards, the PIC32MX470 Curiosity Development Board provides the freedom to develop for a variety of applications, including Internet of Things (IoT), robotics development, and proof-of-concept designs.

This chapter includes the following topics:

- Kit Contents
- Development Board Functionality and Features

1.1 KIT CONTENTS

The PIC32MX470 Family Starter Kit contains the following items:

- One PIC32MX470 Curiosity Development Board
- One on-board PIC32MX470F512H microcontroller

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

chanhvinh.com

1.2 DEVELOPMENT BOARD FUNCTIONALITY AND FEATURES

1.2.1 Development Board

The main features and top assembly of the PIC32MX470 Curiosity Development Board are shown in Figure 1-1:

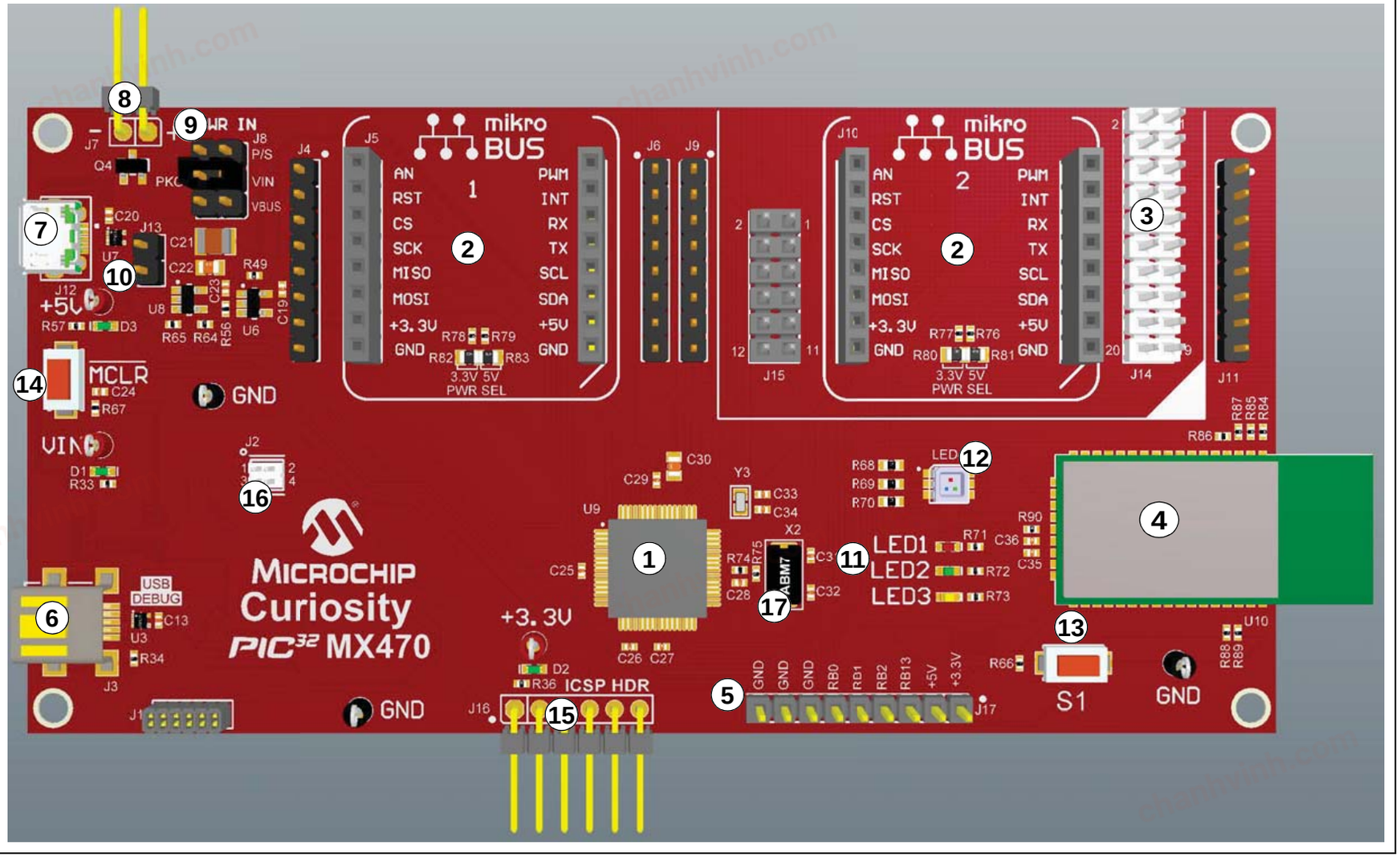
1. PIC32MX470F512H 32-bit microcontroller (U9).
2. Two mikroBUS sockets to expand the functionality using MikroElectronika Click adapter boards (J5, J10).
3. X32 Header for audio I/O using Microchip audio daughter boards (J14, J15).
4. BM64 Bluetooth v4.2 Stereo Audio module footprint for Bluetooth connectivity (U10).
5. GPIO expansion header (J17).
6. Debug USB connector for programming/debugging (J3).
7. Target USB connector for PIC32 USB connectivity (Device/Host mode) (J12).
8. Header for external 5V input (J7).
9. Jumper to select power source: Debug USB connector, Target USB connector and external +5V input (J8).
10. Jumper to drive V_{BUS} in Host mode (J13).
11. Three LEDs (LED1, LED2, LED3).
12. RGB LED (LED4).
13. User button (S1).
14. Reset button ($\overline{MCLR}$).
15. ICSP Header for external debugger, such as MPLAB® REAL ICE™ or MPLAB ICD 3 (J16).
16. Jumper to select on-board debugger or external debugger (J2).
17. 20 MHz crystal oscillator (X2).

For additional information on these features, refer to **Chapter 2. "Hardware"**.

© 2016 Microchip Technology Inc.

chanhvinh.com

FIGURE 1-1: PIC32MX470 CURIOSITY DEVELOPMENT BOARD LAYOUT (TOP VIEW)



© 2016 Microchip Technology Inc.

chanhvinh.com

NOTES:

chanhvinh.com

© 2016 Microchip Technology Inc.

chanhvinh.com

Chapter 2. Hardware

This chapter describes the hardware features of the PIC32MX470 Curiosity Development Board.

2.1 HARDWARE FEATURES

Only certain features of the development board are discussed in this section. Refer to Figure 1-1 in **Section 1.2 "Development Board Functionality and Features"** for their locations.

2.1.1 Processor

The PIC32MX470 Curiosity Development Board is designed with a permanently mounted (i.e., soldered) PIC32MX470F512H microcontroller (U9).

2.1.2 Power Supply

Power can be supplied to the development board from the host PC using a Type A male-to-mini B USB cable or by using an external +5V power supply. Jumper J8 is used to select the voltage source for the development board. Table 2-1 provides the details of the power supply sources available for the development board.

The +3.3V power supply for the microcontroller is generated by the MPC1727 voltage regulator.

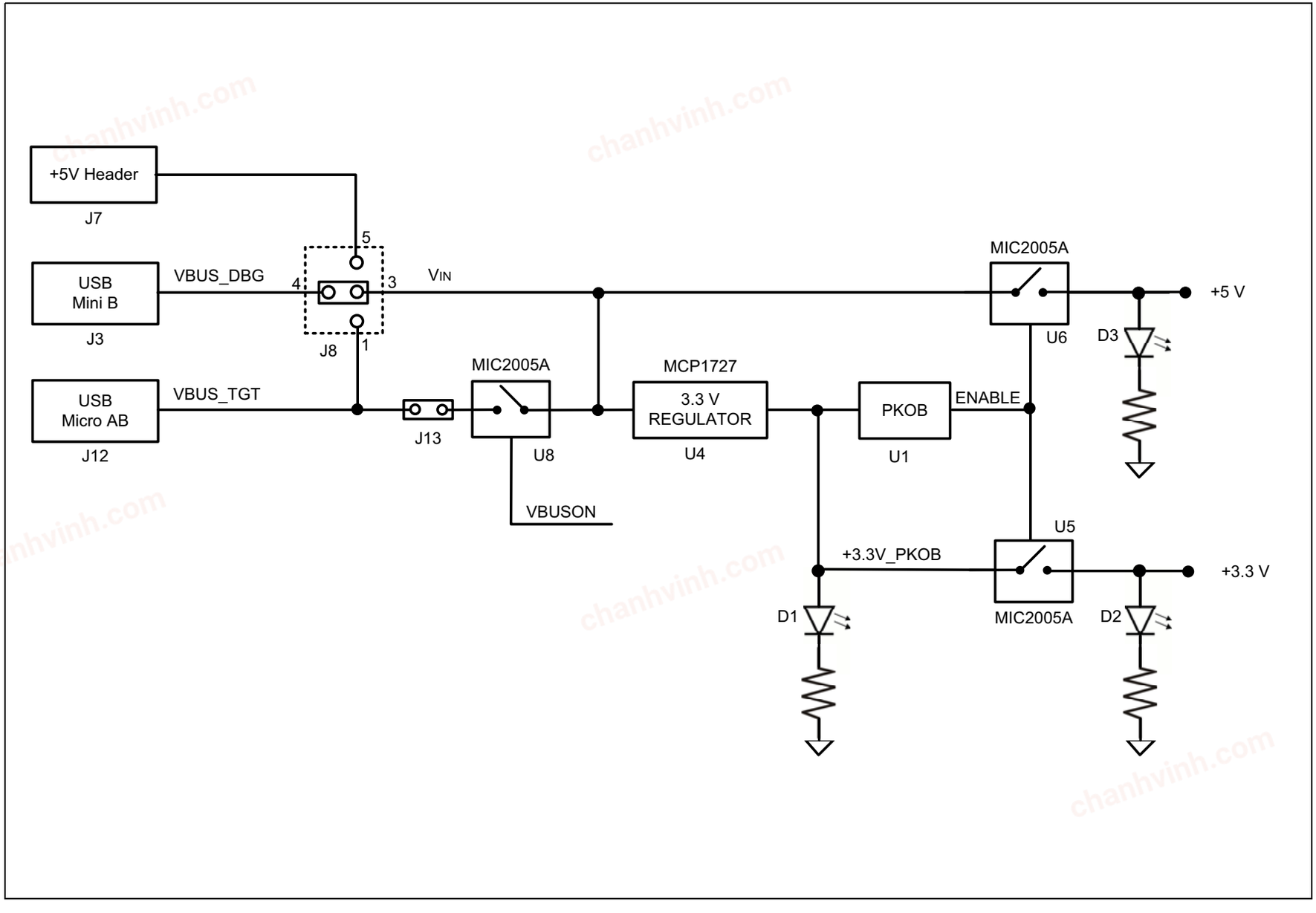
TABLE 2-1: DEVELOPMENT BOARD POWER SUPPLY SOURCES

Power Input	Connection	Jumper Position (J8)
USB mini-B (J3)	Using a Type A male-to-mini B USB cable (not provided with the kit).	4-3
USB micro-AB (J12)	Using a Type A male-to-micro B USB cable (not provided with the kit).	1-3
External +5V (J7)	Connect the development board to an external 5V power supply.	5-3

If the PICkit™ on-board (PKOB) debugger is connected to a host PC, it enumerates with the host computer. Once the debugger is successfully enumerated, it turns on the main board power supply (+3.3V and +5V) using the high side power switch (MIC2005A) by driving the ENABLE signal high. Figure 2-1 shows the power topology for the development board.

chanhvinh.com

FIGURE 2-1: POWER TOPOLOGY



© 2016 Microchip Technology Inc.

chanhvinh.com

2.1.3 Programming and Debug

The PIC32MX470 Curiosity Development Board includes the PICkit on-board (PKOB) debugger based on the PIC24FJ256GB106 USB microcontroller. In addition, it provides the option to use external debuggers, such as MPLAB REAL ICE or MPLAB ICD 3 by connecting to the In-Circuit Serial Programming™ (ICSP™) header, J16.

By default, the on-board debugger is connected to the programming pins (PGEC and PGED) of the PIC32 device. To use an external debugger, remove jumper J2 to disconnect the on-board debugger from driving the programming pins. Table 2-2 provides details of the various debuggers.

TABLE 2-2: DEBUGGER SELECTION

J2 Jumper Positions	
On-board Debugger	**External Debugger**
Pins 1-2 shorted	Pins 1-2 Open
Pins 3-4 shorted	Pins 3-4 Open

2.1.4 USB Connectivity

The PIC32MX470F512H microcontroller has an integrated full-speed USB module that enables the user to implement the USB functionality through the micro-AB USB connector (J12). Users can connect the development board for USB functionality using any one of these modes:

- **Device Mode:** Connect the host PC to the target USB connector (J12) using the USB Type A male to micro-B male cable. Use jumper J8 to select the required power source for the board.
- **Host Mode:** Connect the USB device to the target USB connector (J12) using a USB Type A Female to micro-B male cable (this cable is not included in the kit). Install a jumper in the J13 header to drive the VBUS line in Host mode. Use jumper J8 to select the power source from either the Debug USB connector or the external 5V input.

2.1.5 Switches

The PIC32MX470 Curiosity Development Board contains two push buttons: Reset button ($\overline{MCLR}$) and user-configurable button (S1). The Reset button is connected to the PIC32 Master Clear Reset line and the other is a generic user-configurable button. When a button is pressed, it will drive the I/O line to GND. Table 2-3 provides details of the push buttons.

TABLE 2-3: PUSH BUTTONS

Push Button Name	Microcontroller Pin
$\overline{MCLR}$	$\overline{MCLR}$
S1	RD6

© 2016 Microchip Technology Inc.

chanhvinh.com

2.1.6 LEDs

Four user-programmable LEDs are available on the PIC32MX470 Curiosity Development Board, and these LEDs can be turned ON/OFF using the connected GPIO pins. Table 2-4 provides details of the LEDs and related GPIO pins.

The RGB LEDs (LED4) are connected to the re-mappable pins with an output compare functionality to control the color and brightness with PWM output. In the RGB LED, red is the component of the GPIO pin RB10, green is the component of the GPIO pin RB3, and blue is the component of the GPIO pin RB2.

TABLE 2-4: LEDS

LED Name	Microcontroller Pin
LED1 (red)	RE4
LED2 (yellow)	RE6
LED3 (green)	RE7
LED4 (RGB LEDs - red, green, blue)	RB10, RB3, RB2

2.1.7 Oscillator Options

A 20 MHz crystal (X2) is connected to the on-board PIC32MX470F512H microcontroller for precision clocking. The 12-Mbps USB full-speed signal rate specification requires ±0.25% or 2500 ppm clock accuracy. Therefore, an external crystal is required to meet the clock accuracy requirement for USB. Non-USB applications can use the internal RC oscillators.

The PIC32MX470 Curiosity Development Board also has provision for an external secondary 32 kHz oscillator (Y3); however, this component is not populated.

2.1.8 mikroBUS™ Sockets

Two mikroBUS sockets (J5, J10) are available on the development board, and these sockets can be used to expand the functionality using the MikroElectronika Click adapter boards. The mikroBUS connector consists of two 1x8 female headers with SPI, I^2C, UART, RST, PWM, analog, interrupt lines as well as 3.3V, 5V, and GND power lines.

The GPIO pins for the mikroBUS sockets are assigned to route, as follows:

- UART1, I2C1, SPI1 and OC1 peripheral instances to mikroBUS socket J5. The UART1 and SPI1 peripherals are also routed to the BM64 Bluetooth 4.2 Stereo Audio module.
- UART2, I2C2, SPI2 and OC2 peripheral instances to mikroBUS socket J10. The UART2, I2C2, and SPI2 peripherals are also routed to the X32 audio header.

2.1.9 X32 Audio Header

The PIC32MX470 Curiosity Development Board includes two X32 headers (J14, J15) to enable a connection to the Microchip Audio Codec daughter board. Table 2-5 provides the details of the available daughter board and for additional information, contact your local Microchip sales office.

For a complete list of currently available audio daughter boards, visit the microchipDIRECT web site (www.microchipdirect.com).

TABLE 2-5: AUDIO DAUGHTER BOARD

Daughter Board Name	Microchip Part Number
PIC32 Audio Codec Daughter Board - AK4642EN	AC320100

© 2016 Microchip Technology Inc.

chanhvinh.com

2.1.10 BM64 Bluetooth 4.2 Stereo Audio Module

The PIC32MX470 Curiosity Development Board includes the footprint for the BM64 Bluetooth 4.2 Stereo Audio module to support Bluetooth audio. The PIC32 microcontroller uses the UART to send commands to the BM64 module and the I^2S interface for audio data.

2.1.11 PIC32 I/O Header

The PIC32MX470 Curiosity Development Board provides a header (J17) to access unused microcontroller GPIO pins.

2.1.12 Peripheral Resource Assignment

The MCU peripheral instances, assigned for different hardware interfaces, are provided in Table 2-6. The correct peripheral instance must be used in the application to use the respective hardware interface.

TABLE 2-6: RESOURCE ASSIGNMENT

Resource Assignment	Peripheral				
	I^2C	SPI	UART	Output Compare	Interrupt
MikroBus1 (J5)	I2C1	SPI1	UART1	OC1	INT1
MikroBus2 (J10)	I2C2	SPI2	UART2	OC2	INT0
X32 (J14, J15)	I2C2	SPI2	UART2	—	—
BM64	—	SPI1	UART1	—	—
RGB LED	—	—	—	OC3, OC4, OC5	—

chanhvinh.com

NOTES:

chanhvinh.com

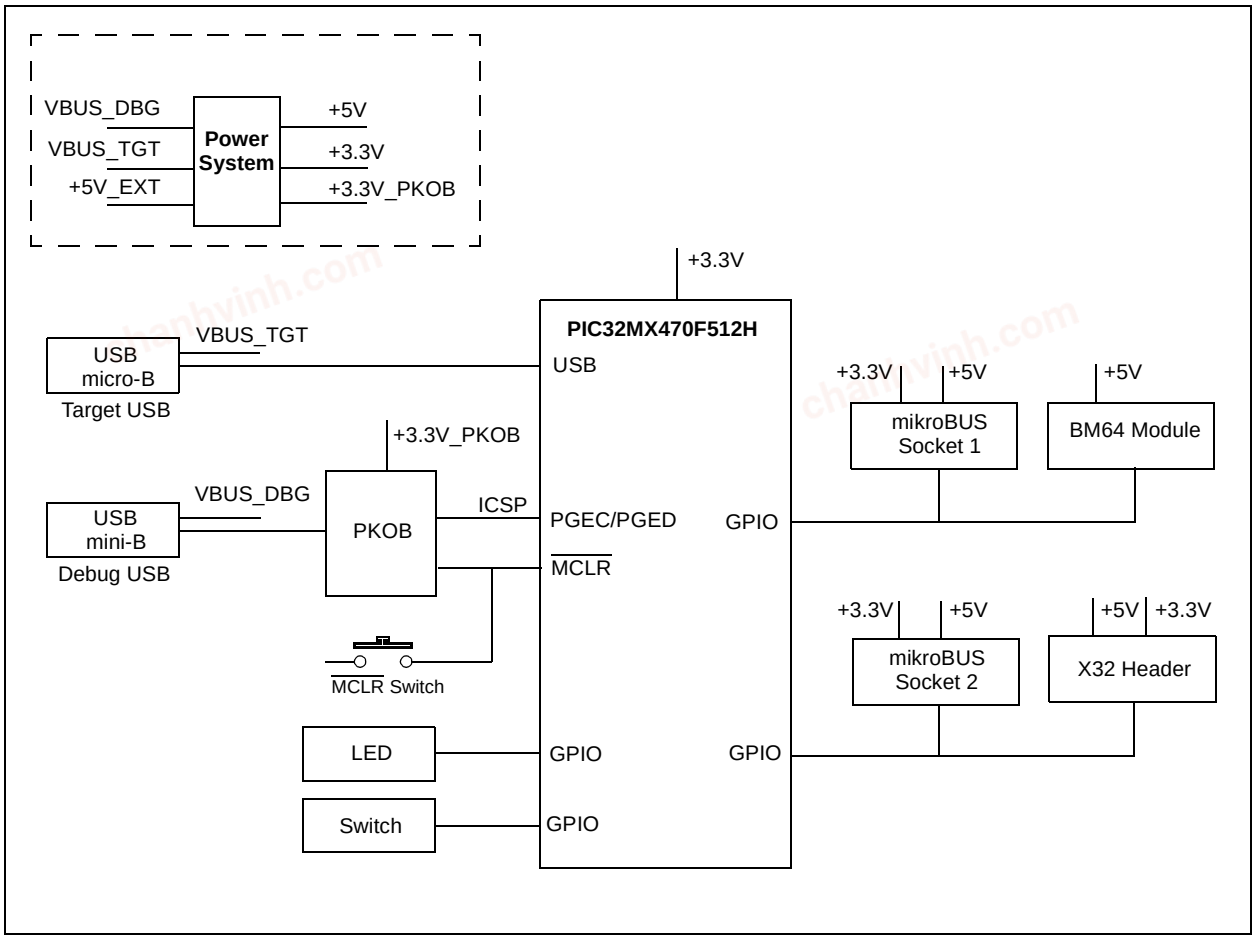
© 2016 Microchip Technology Inc.

chanhvinh.com

Appendix A. Schematics

A.1 BLOCK DIAGRAM

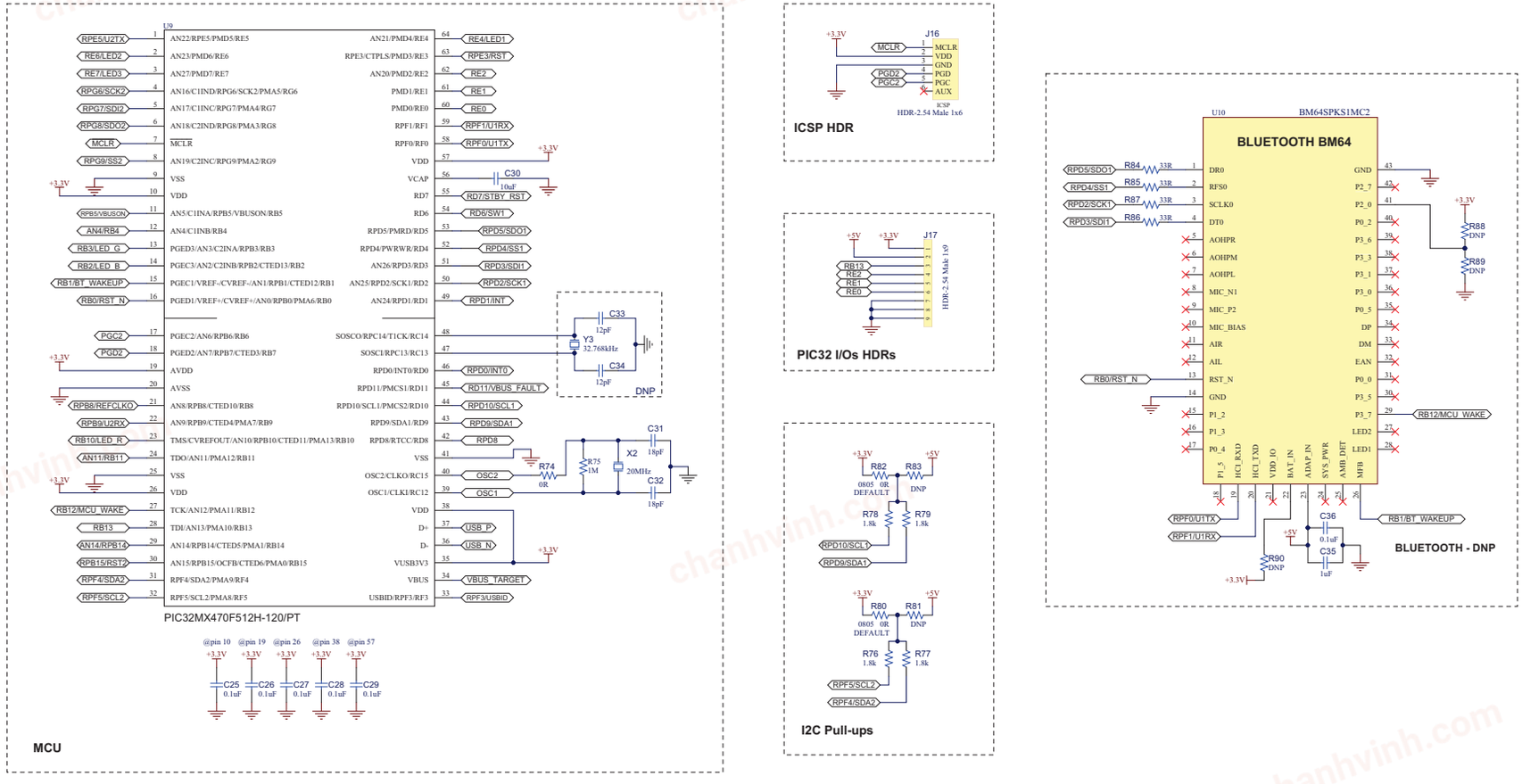
FIGURE A-1: HIGH-LEVEL BLOCK DIAGRAM OF THE PIC32MX470 CURIOSITY DEVELOPMENT BOARD



chanhvinh.com

A.2 SCHEMATICS

FIGURE A-2: PIC32MX470 CURIOSITY DEVELOPMENT BOARD SHEET 1 OF 3

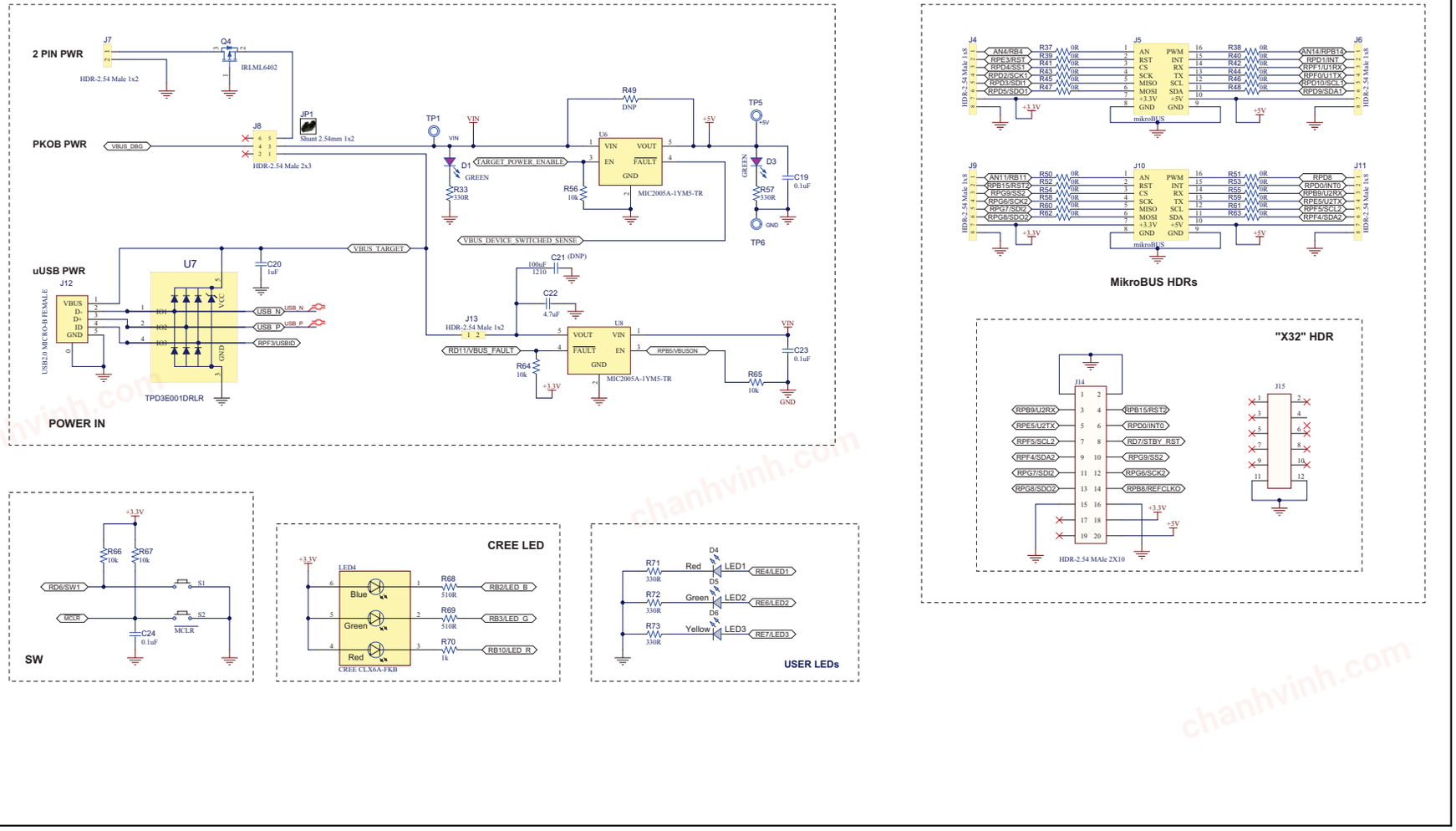


© 2016 Microchip Technology Inc.

chanhvinh.com

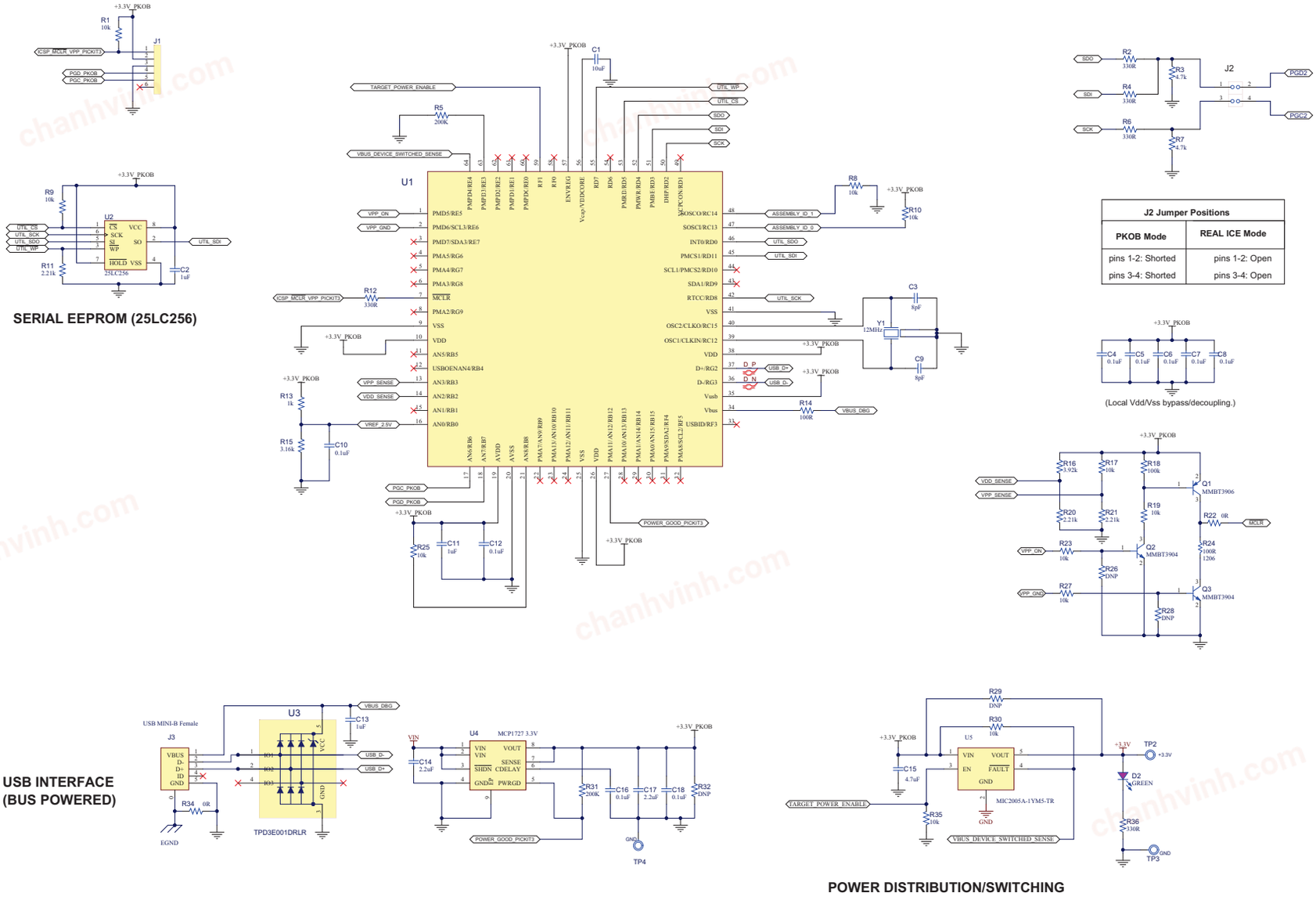
© 2016 Microchip Technology Inc.

FIGURE A-3: PIC32MX470 CURIOSITY DEVELOPMENT BOARDSHEET 2 OF 3



chanhvinh.com

FIGURE A-4: PIC32MX470 CURIOSITY DEVELOPMENT BOARD SHEET 3 OF 3



© 2016 Microchip Technology Inc.

chanhvinh.com

Appendix B. Bill of Materials

B.1 PIC32MX470 CURIOSITY DEVELOPMENT BOARD BILL OF MATERIALS

TABLE B-1: BILL OF MATERIALS

Reference	Description	Manufacturer	Part No.
C4, C5, C6, C7, C8, C10, C12, C13, C16, C18, C19, C20, C23, C24, C25, C26, C27, C28, C29, C35	CAP CER .10 µF 50V X7R 0402	Samsung	CL05B104KO5NNNC
C1, C30	CAP CER 10 µF 10V 10% X7R SMD 0805	Murata	GRM21BR71A106KE51L
C2, C11, C36	CAP CER 1 µF 10V 10% X5R SMD 0402	Murata	GRM155R61A105KE15D
C3, C9	CAP CER 8 pF 50V C0G 0402	TDK Corporation	C1608C0G1H080D080AA
C31, C32	CAP CER 18 pF 50V 2% NP0 SMD 0402	Murata	GRM1555C1H180GA01D
C14, C17	CAP CER 2.2 µF 16V X5R 0603	TDK Corporation	C1608X5R1C225K
C15	CAP CER 4.7 µF 10V X5R 0603	Taiyo	LMK107BJ475KA-T
C22	CAP CER 4.7 µF 10V 10% X7R SMD 0805	TDK Corporation	C2012X7R1A475K125AC
R70	RES TKF 1k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF1001V
R13, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R50, R51, R52, R53, R54, R55, R58, R59, R60, R61, R62, R63	RES TKF 1k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF1001X
R14	RES TKF 100R 5% 1/16W SMD 0402	Yageo	RC0402JR-07100RL
R16	RES TKF 3.92K 1% 1/16W SMD 0402	Yageo	RC0402FR-073K92L
R75	RES TKF 1M 1% 1/16W SMD 0402	Panasonic	ERJ-2RKF1004X
R24	RES TKF 100R 1% 1/4W SMD 1206	Yageo	RC1206FR-07100RL
R1, R8, R9, R10, R17, R19, R23, R25, R27, R30, R35, R56, R64, R65, R66, R67	RES TKF 10k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF1002X
R68, R69	RES TKF 510R 1% 1/10W SMD 0603	ROHM	MCR03EZPFX5100
R3, R7	RES TKF 4.7k 5% 1/10W SMD 0402	Panasonic	ERJ-2GEJ472X
R5, R31	RES TKF 200k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF2003X
R11, R20, R21	RES TKF 2.2k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF2201X
R18	RES TKF 100k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF1003X
R22, R34, R74	RES TKF 0R 1/16W SMD 0402	Yageo	RC0402JR-070RL

© 2016 Microchip Technology Inc.

chanhvinh.com

TABLE B-1: BILL OF MATERIALS (CONTINUED)

Reference	Description	Manufacturer	Part No.
R2, R4, R6, R12, R33, R36, R57, R71, R72, R73	RES TKF 330R 5% 1/10W SMD 0402	Panasonic	ERJ-2GEJ331X
R15	RES SMD 3.16K OHM 1% 1/16W 0402	Yageo	RC0402FR-073K16L
R76, R77, R78, R79	RES SMD 1.8K OHM 1% 1/10W 0402	Panasonic	ERJ-2RKF1801X
R80, R82	RES TKF 0R 1/8W SMD 0805	Panasonic	ERJ-6GEY0R00V
R84, R85, R86, R87	RES TKF 33R 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF33R0X
LED4	LED RGB CLX6A-FKB	Cree	CLX6A-FKB-CK1P1G1BB7R3R3
LED3	LED, SMD, YEL, 0603 package	Kingbright	APT1608YC
LED1	LED, SMD, RED, 0603 package	Kingbright	APT1608EC
D1, D2, D3, LED2	LED, SMD, GRN, 0603 package	Kingbright	APT1608SGC
S1, MCLR	SWITCH TACTILE SPST-NO 0.05A 12V	APEM INC	ADTSM32RVTR
Q4	TRANS FET P-CH IRLML6402 -20V -3.7A 1.3W SOT-23-3	International Rectifier	IRLML6402TRPBF
Q1	TRANS BJT PNP MMBT3906 -40V -200 mA 300mW SOT-23-3	NXP Semiconductors	PMBT3906,215
Q2, Q3	TRANS BJT NPN MMBT3904 40V 200 mA 310 mW SOT-23-3	Diodes Incorporated	MMBT3904-7-F
J7	CON HDR-2.54 Male 1x2 RA	Samtec	TSW-102-06-T-S
J13	CON HDR-2.54 Male 1x2	Sullins	PREC002SAAN-RC
J8	CON HDR-2.54 Male 2x3	Samtec	TSW-103-07-S-D
J12	USB - micro B 2.0 Recep. Conn 5 POS SM RA	Amphenol	10118194-0001LF
J5, J10	mikroBUS HOST	Sullins	PPTC081LFBN-RC
J14	CON HDR-0.1" Male 2x10	Samtec	TSW-110-07-G-D-020
J15	CON HDR-0.1" Male 2x6	Samtec	TSW-106-07-G-D
J2	HDR_JMPR_2X2_TH_0.05"	Samtec	FTS-102-01-F-D
@J2	CONN JUMPER SHORTING 1.27MM GOLD	Sullins	NPB02DVFN-RC
J3	USB - mini B USB 2.0 Receptacle Connector 5 Position Surface Mount, Right Angle, Horizontal	Hirose	UX60-MB-5ST
X2	CRYSTAL 20.0 MHz 20 ppm 18 pF SMD ABM7	Abracon	ABM7-20.000MHZ-D2Y-T
Y1	CRYSTAL 12 MHz 8 pF SMD NX3225SA	AVX	NX3225SA-12.000000MHZ
U3, U7	ESD Protection -TPD3E001DRLR	TI	TPD3E001DRLR
RUBBER FEET	BUMPER CYLIN 0.312" DIA BLK	3M	SJ61A1
JP1 @ J8	SHUNT JUMPER .1" BLACK GOLD	3M	969102-0000-DA
U10	Bluetooth Module BM64	Microchip Technology Inc.	BM64SPKS1MC2
U9	PIC32MX470F512H-120/PT TQFP-64	Microchip Technology Inc.	'PIC32MX470F512H-120/PT
U1	IC PIC MCU FLASH 256K 64-TQFP	Microchip Technology Inc.	PIC24FJ256GB106-I/PT
U2	MCHP MEMORY SERIAL EEPROM 256k SPI 25LC256-E/SN SOIC-8	Microchip Technology Inc.	25LC256T-E/SN
U4	MCHP ANALOG LDO 3.3V MCP1727-3302E/MF	Microchip Technology Inc.	MCP1727-3302E/MF
U5, U6, U8	IC SWITCH LOAD FULL FUNC SOT23-5	Microchip Technology Inc.	MIC2005A-1YM5-TR

© 2016 Microchip Technology Inc.

chanhvinh.com

NOTES:

chanhvinh.com

chanhvinh.com

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: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon

Hong Kong
Tel: 852-2943-5100
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 - Dongguan
Tel: 86-769-8702-9880

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

China - Hangzhou
Tel: 86-571-8792-8115
Fax: 86-571-8792-8116

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

ASIA/PACIFIC

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

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

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: 886-7-213-7828

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 - Karlsruhe
Tel: 49-721-625370

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

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

06/23/16

© 2016 Microchip Technology Inc.