MPLAB® Xpress Evaluation Board User's Guide

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ISBN: 978-1-5224-0457-6

Object of Declaration:MPLAB® Xpress Evaluation Board User's Guide

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

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

Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our 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 when using the Microchip MPLAB® Xpress Evaluation Board User's Guide. Topics discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip WebSite
- Development Systems Customer Change Notification Service
- Customer Support
- Revision History

DOCUMENT LAYOUT

This document describes how to use the MPLAB® Xpress Evaluation Board User's Guide as a development tool to emulate and debug firmware on a target board. The document is organized as follows:

- **Chapter 1. "Introduction to the MPLAB® Xpress Evaluation Board"** – This chapter contains general information regarding the Xpress Evaluation Board kit contents, layout and power sources.
- **Chapter 2. "Getting Started"** – This chapter offers information on how to program the Xpress Evaluation Board, as well as how to import an existing MPLAB X IDE project.
- **Appendix A. "Schematic"** – This appendix contains the Xpress Evaluation Board schematic.

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) { ... }`

RECOMMENDED READING

This user's guide describes how to use the Xpress Evaluation Board. For the latest information on using other tools, refer to the MPLAB® X IDE home page: www.microchip.com/mplabx/. This resource page contains updated documentation, downloads and links to other MPLAB X IDE compatible tools, plug-ins and much more.

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
- **MPLAB® Xpress Evaluation Board User's Guide** – Specific product support can be accessed via our website at www.microchip.com/mplab/mplab-xpress
- **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, listings of Microchip sales offices, distributors and factory representatives

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM™ assembler); all MPLAB linkers (including MPLINK™ object linker); and all MPLAB librarians (including MPLIB™ object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE™ and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit™ 3 debug express.
- **MPLAB X IDE** – The latest information on Microchip MPLAB X IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers, such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are non-production development programmers, such as PICSTART® Plus and PICkit 2 and 3.

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 website at:

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

REVISION HISTORY

Revision A (April 2016)

Initial release of this document.

Chapter 1. Introduction to the MPLAB® Xpress Evaluation Board

The MPLAB Xpress Evaluation Board is a development tool designed to work in conjunction with the cloud-based MPLAB Xpress Integrated Development Environment (IDE). The combination of the IDE and the Xpress Evaluation Board allows for quick experimentation and code development without having to download the IDE or compilers. The Xpress board contains a built-in programmer and includes an 8-bit PIC16F18855 microcontroller, allowing for easy programming without additional programming tools. The Xpress board also contains a set of four indication LEDs, a potentiometer, a push button switch and a mikroBUS™ socket to accommodate a variety of plug-in MikroElektronika click boards that can be used in application development. The Xpress board contains two sections: the programmer section and the application section. The programmer section contains the circuitry necessary for programming, while the application section contains the circuitry that is used by the application.

1.1 MPLAB Xpress EVALUATION BOARD KIT CONTENTS

The Xpress Evaluation Board kit contains the following:

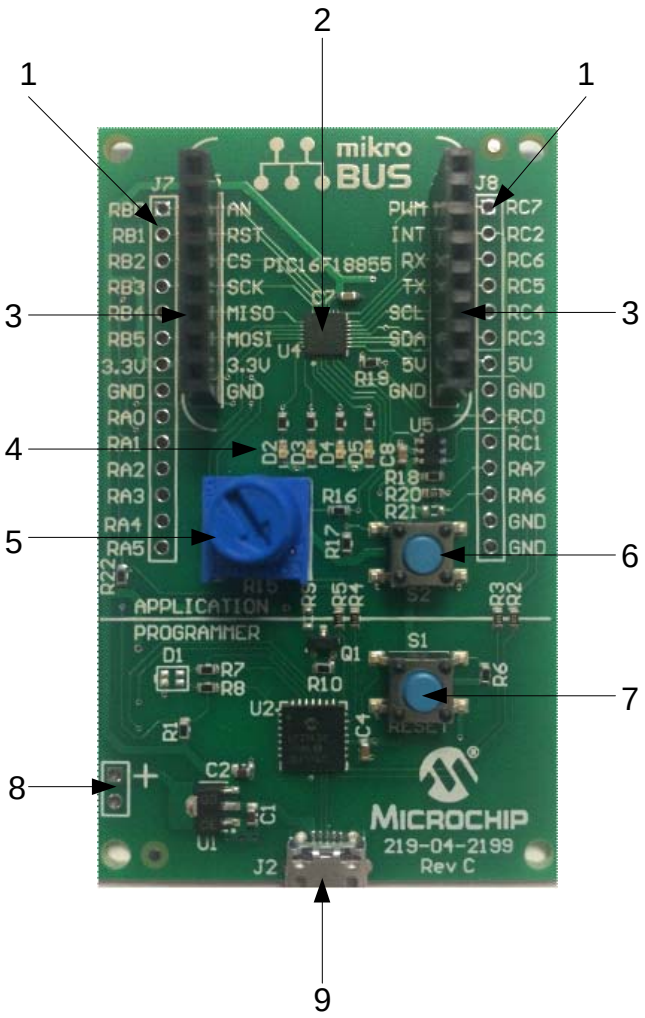
- Xpress Evaluation Board
- Quick Start Guide

FIGURE 1-1: MPLAB® Xpress EVALUATION BOARD KIT

1.2 MPLAB Xpress EVALUATION BOARD LAYOUT

Figure 1-2 identifies the major features of the MPLAB Xpress Evaluation Board.

FIGURE 1-2: MPLAB® Xpress EVALUATION BOARD LAYOUT



1. PIC® MCU Input/Output Connections
2. PIC16F18855 Microcontroller
3. mikroBUS™ Click Board Socket
4. LEDs
5. Potentiometer
6. Push Button
7. Master Clear Reset Button
8. Battery Connection
9. Micro USB Connector

1.3 POWER SOURCES

The MPLAB Xpress Evaluation Board can be powered in one of two ways, depending on its usage. It should be noted that only one power source should be connected at a time.

1.3.1 USB Connector (J2)

The USB connector (J2) will power the entire Xpress Evaluation Board. With USB power connected to J2, power LED D1 will always be on (green) to indicate that +3.3V is available on the board.

1.3.2 2.7V-16V External Power Supply

The external power supply (Figure 1-2) will also power the entire Xpress Evaluation Board. The external power supply is connected to a Low Dropout (LDO) voltage regulator, configured to deliver 3.3V to the Xpress board. The external power supply range is from 2.7V to 16V, allowing use with two to six primary cell, 9V alkaline batteries, or one or two-cell Li-Ion batteries. LED D1 will illuminate green when the external power supply is active and supplying sufficient voltage.

NOTES:

Chapter 2. Getting Started

The Xpress Evaluation Board was designed to work with the MPLAB Xpress IDE, but can also be used with MPLAB X IDE. MPLAB Xpress IDE does not require any downloads and can be accessed by visiting mplabxpress.microchip.com.

The Xpress Evaluation Board allows for rapid development of custom applications without the need to download the IDE or compilers to a computer and allows the storage of a project in the cloud. This allows a user the ability to access their project from virtually anywhere (requires Internet connection) and from any computer. Microchip also provides code examples to help get you started.

2.1 PROGRAMMING THE MPLAB Xpress EVALUATION BOARD

Programming the Xpress board is accomplished by connecting a micro USB cable to the on-board USB connector (J2), creating the `.hex` file, and dragging and dropping the `.hex` file into the Xpress board.

To begin, connect a micro USB cable to the on-board USB connector (J12). Next, open the MPLAB Xpress IDE.

FIGURE 2-1: SELECTING THE Xpress EVALUATION BOARD IN THE MPLAB® X IDE

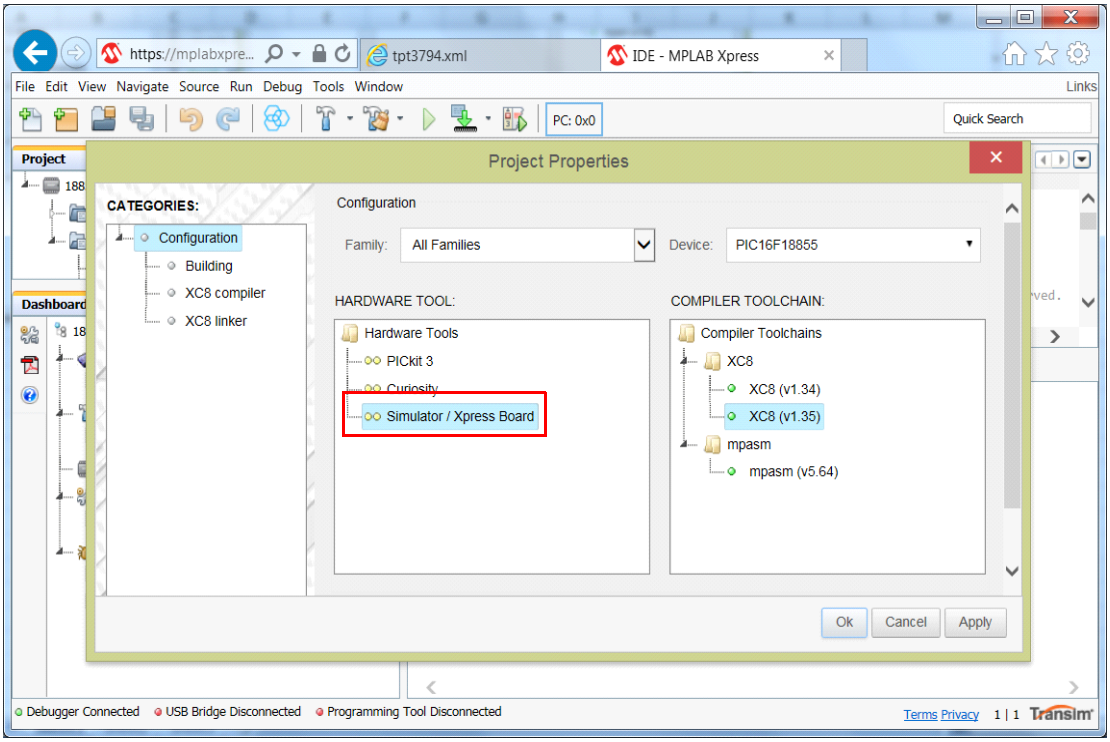
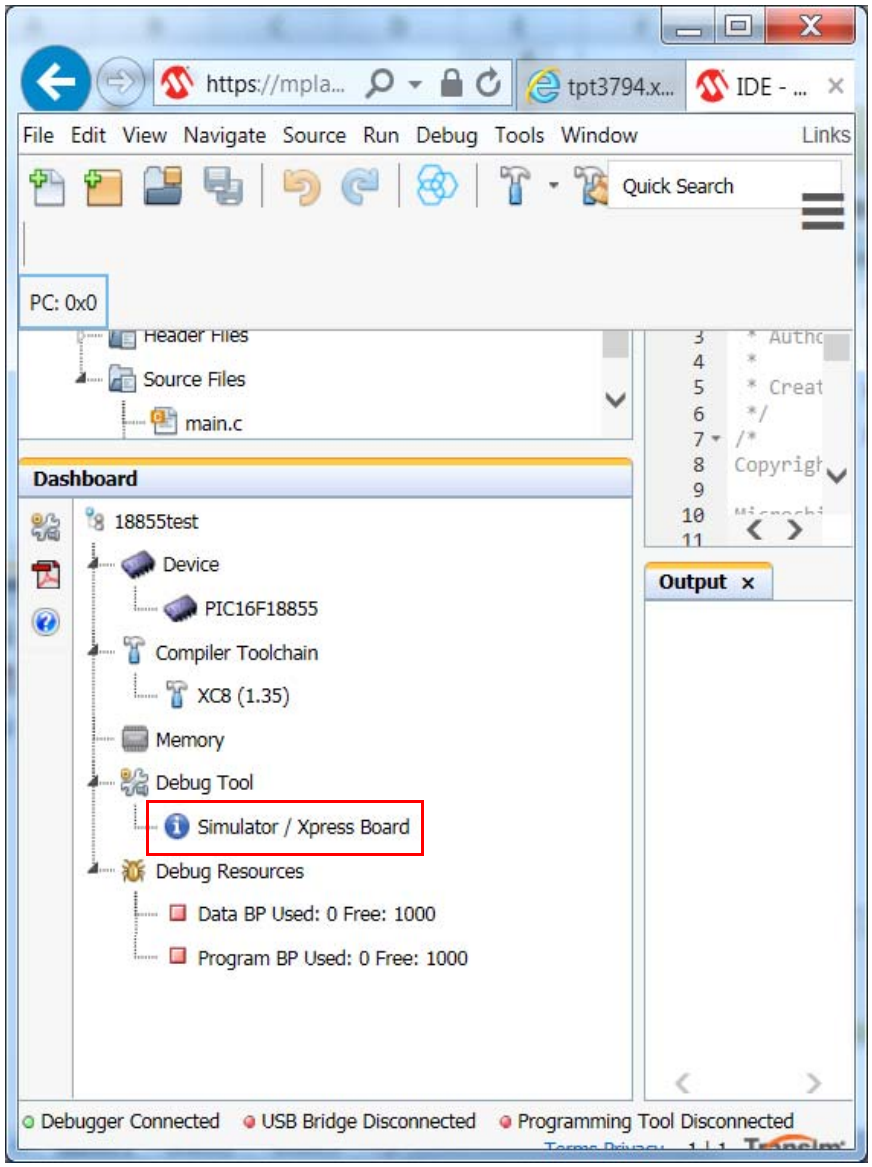
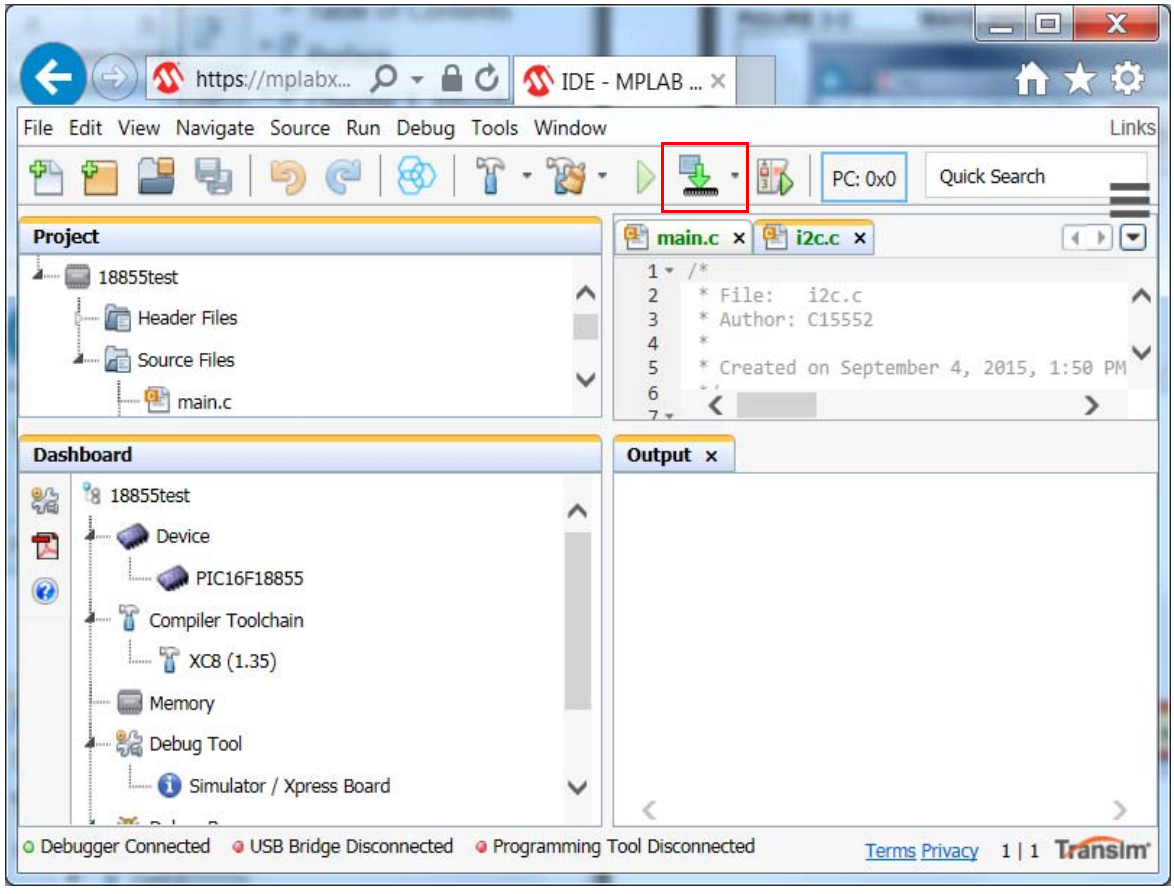


FIGURE 2-2: SELECTING THE XPRESS EVALUATION BOARD IN THE MPLAB XPRESS IDE (CONT)



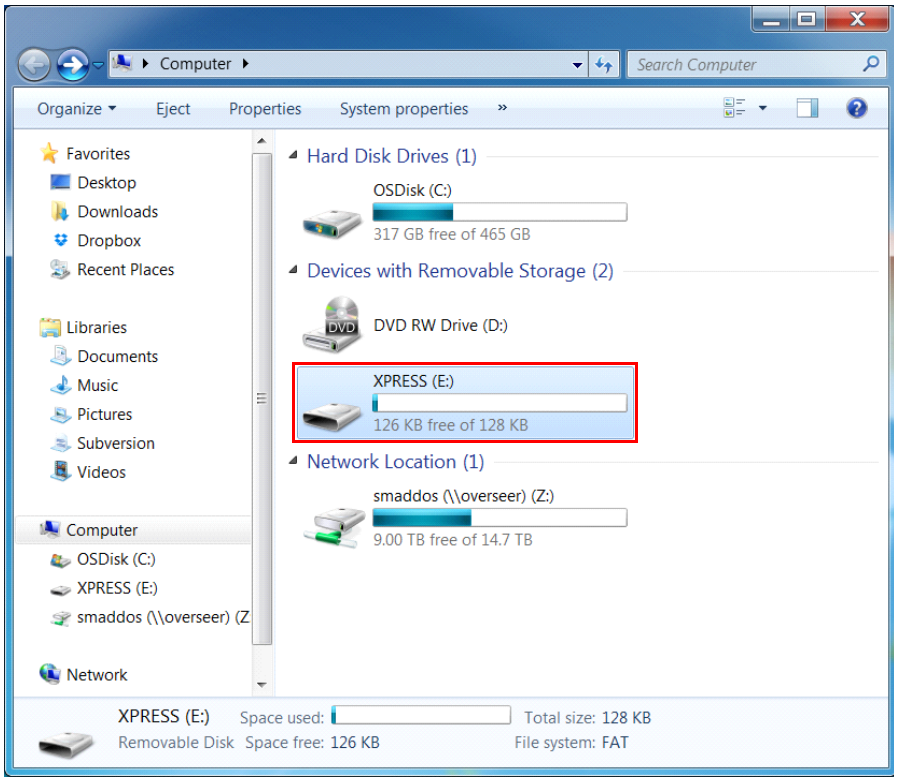
Once MPLAB Xpress is configured and connected to the Xpress Evaluation Board, a new project can be started, or either an existing MPLAB Xpress project or MPLAB X IDE project can be loaded. The procedure to create a new project or open an existing MPLAB Xpress project is the same as within MPLAB X IDE. Navigate to the **File** tab, select Project Properties > Configuration > Hardware Tool > Hardware Tools and select 'Simulator/Xpress Board' (see Figure 2-1). This ensures that the Xpress board is chosen as the development tool. Once selected, the 'Simulator/Xpress Board' selection will appear under the 'Debug Tool' section in the Dashboard window (see Figure 2-2). Once the project is open and ready to program into the target device, simply click on the **Make and Program Device** button (see Figure 2-3). MPLAB Xpress will build and compile the project, and once completed, will open or save the `.hex` file that was created. Under the **Save** button, you can either hit **Save** and the `.hex` file will be stored in your downloads folder, or you can hit **Save as** and choose the location for the `.hex` file. It is important to remember where the file is stored since the `.hex` file is what will be
programmed into the target PIC® device.

FIGURE 2-3: MAKE AND PROGRAM DEVICE



The Xpress Evaluation Board will show as a mass storage device on the computer (see Figure 2-4). To program the device, simply drag and drop the `.hex` file image into the Xpress drive.

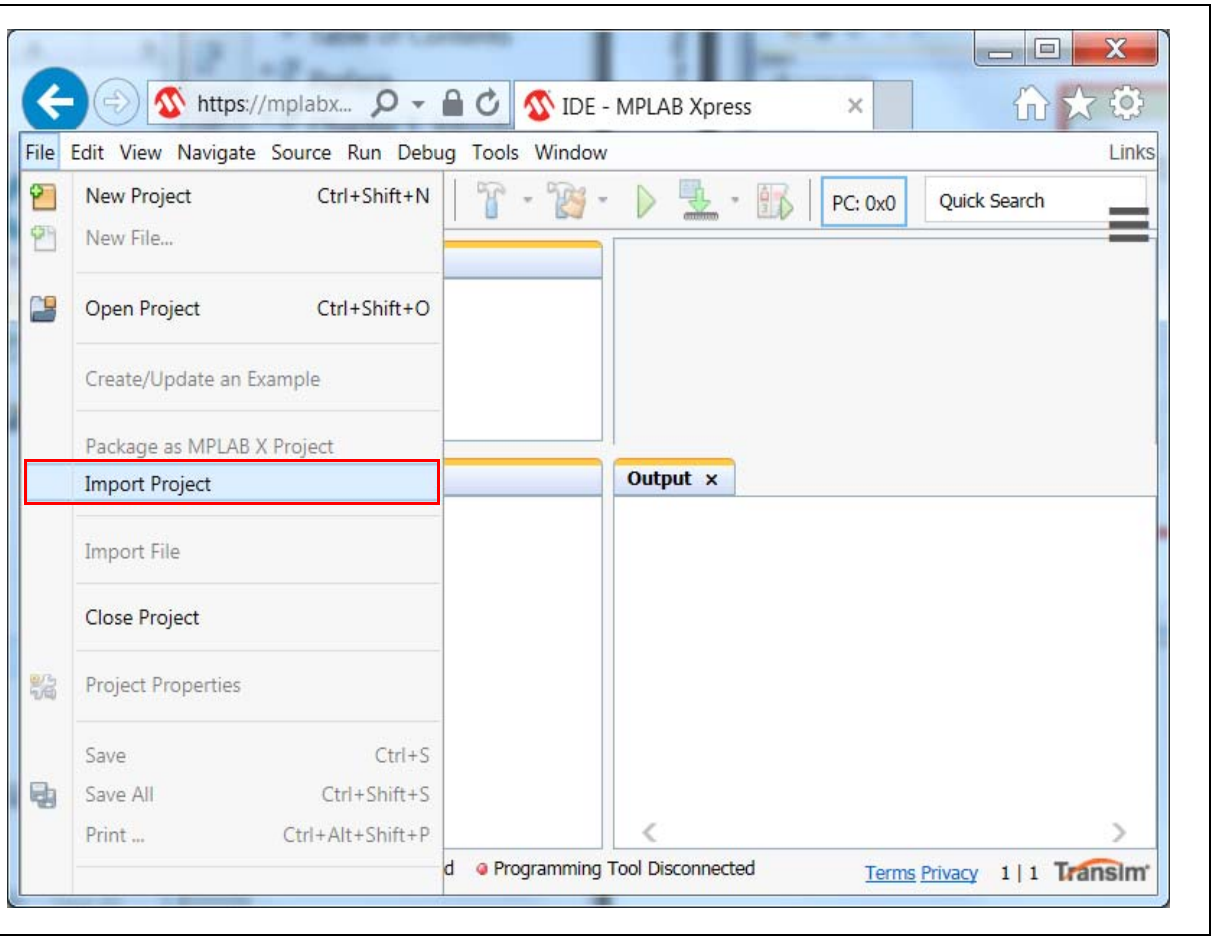
FIGURE 2-4: MPLAB® Xpress BOARD AS MASS STORAGE



2.2 USING AN EXISTING MPLAB X IDE PROJECT

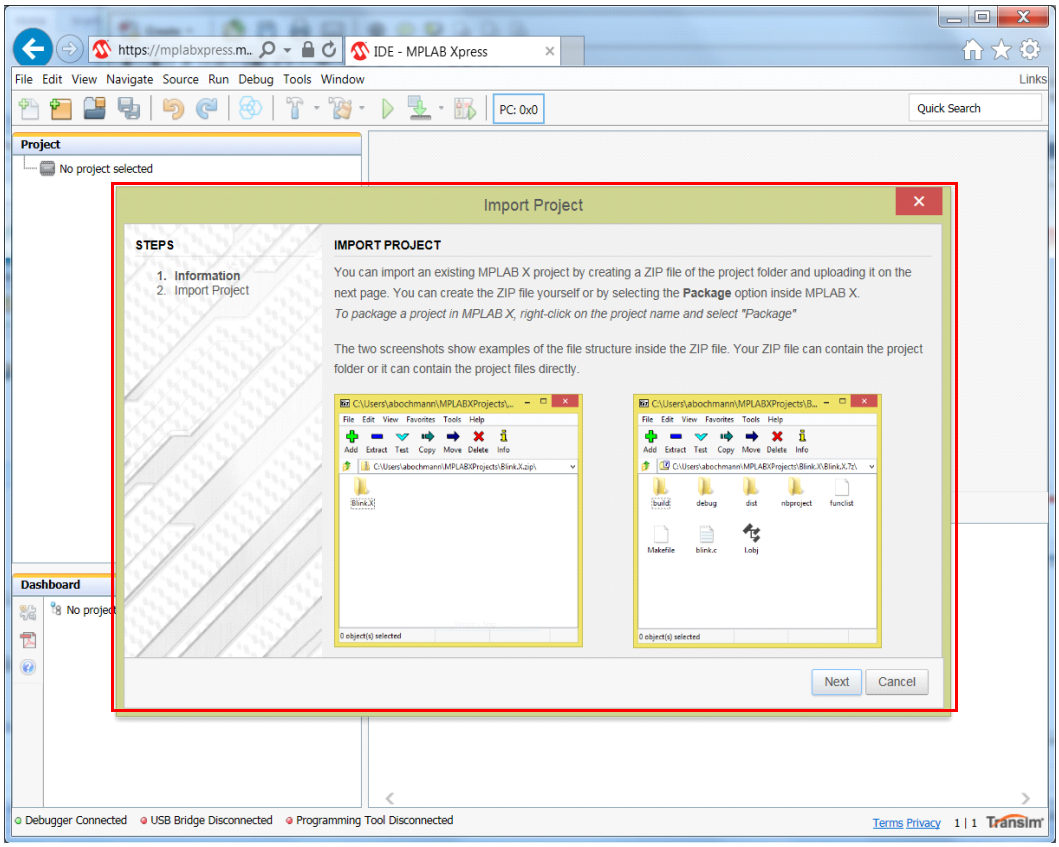
To load an existing MPLAB X IDE project into MPLAB Xpress, the MPLAB X IDE project must be packaged so that it can be imported by MPLAB Xpress. In MPLAB X IDE, right click on the project that is to be imported into MPLAB Xpress and select **Package**. MPLAB X IDE will create a ZIP file that will be imported by MPLAB Xpress. Open MPLAB Xpress and under the **File** tab, select **Import Project** (see Figure 2-5).

FIGURE 2-5: IMPORT EXISTING MPLAB® X IDE PROJECT



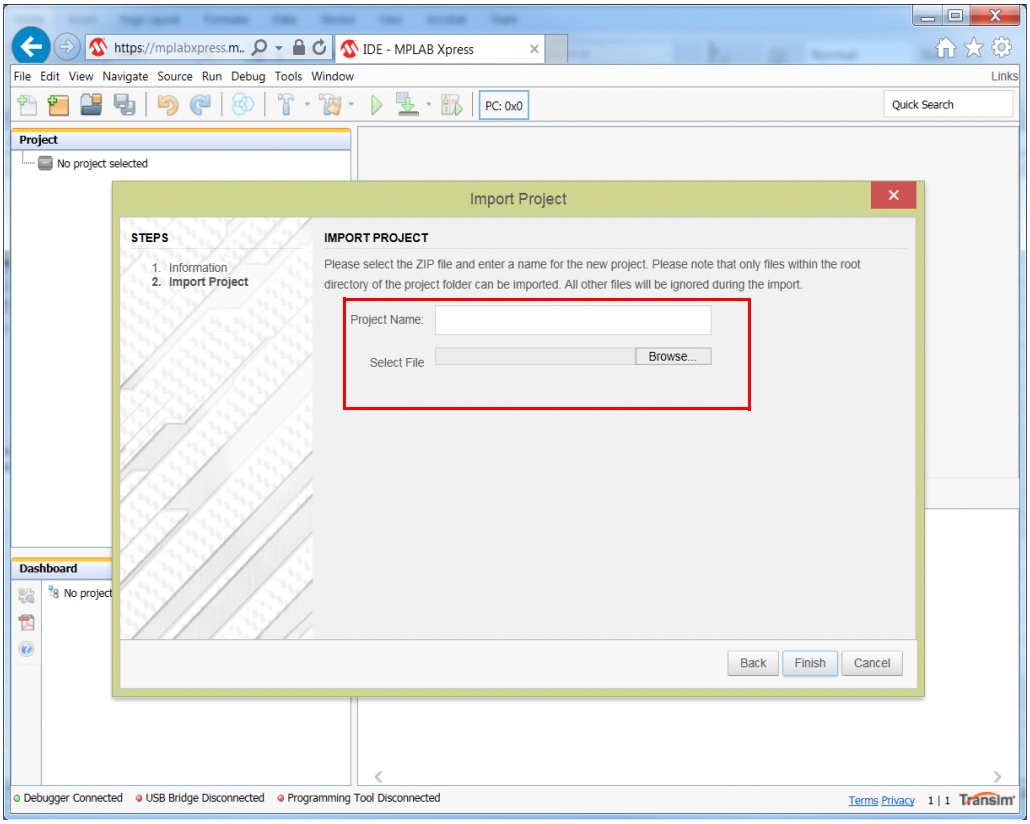
The Import Project window will appear (see Figure 2-6). The window also explains how to prepare your MPLAB X IDE project to import. Click **Next**.

FIGURE 2-6: IMPORT PROJECT WINDOW



The Import Project window will now ask for a project name and allow you to browse for your MPLAB X IDE project (see Figure 2-7). Add a name to your project and then navigate to the folder in which your ZIP file was stored. Select the ZIP file and click **Finish**. MPLAX Xpress will then open your ZIP file and load the necessary files.

FIGURE 2-7: NAMING AND SELECTING MPLAB® X IDE PROJECT TO IMPORT



Appendix A. Schematic

A.1 MPLAB Xpress EVALUATION BOARD SCHEMATIC

FIGURE A-1: MPLAB® Xpress EVALUATION BOARD SCHEMATIC (APPLICATION SECTION)

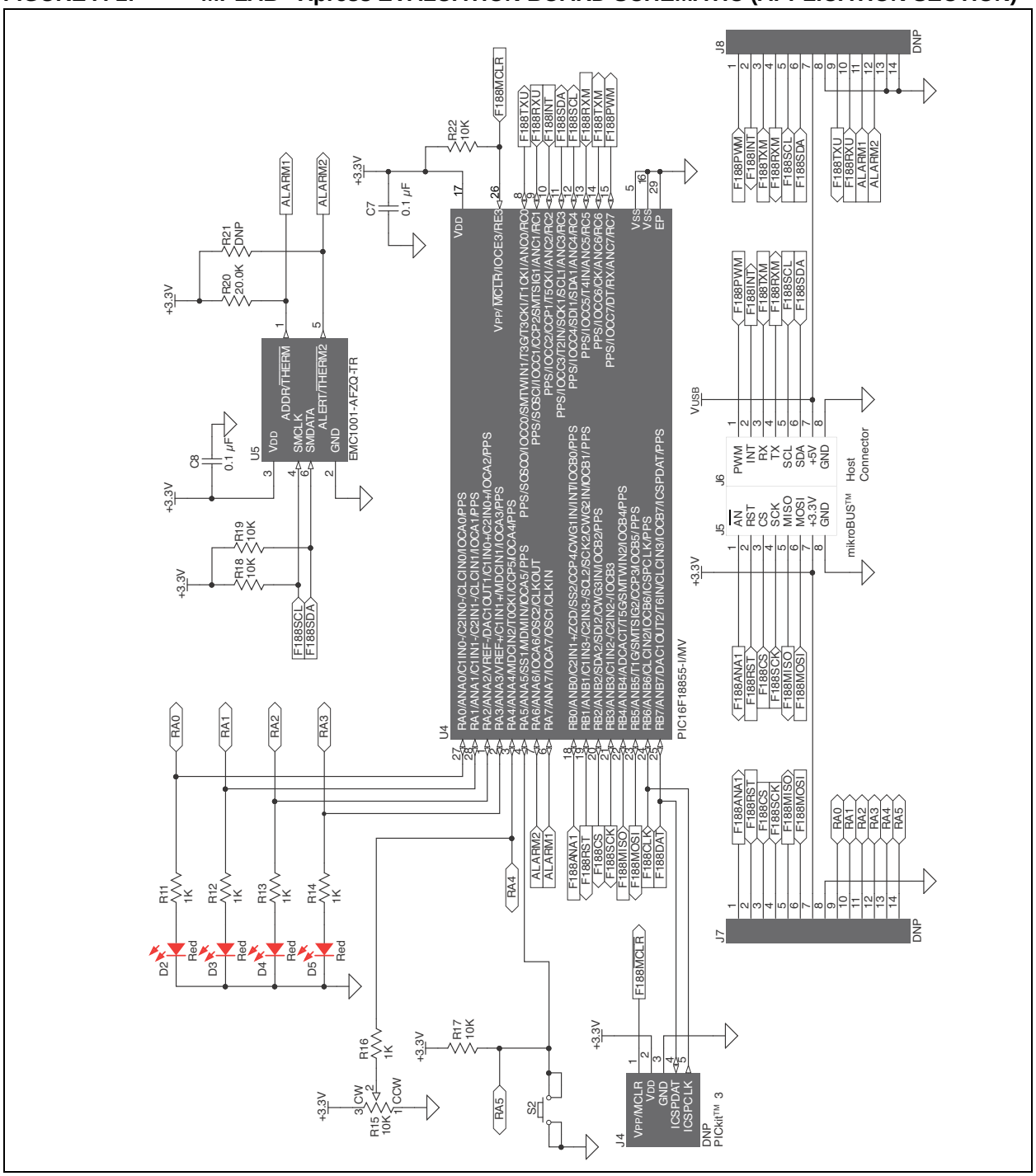
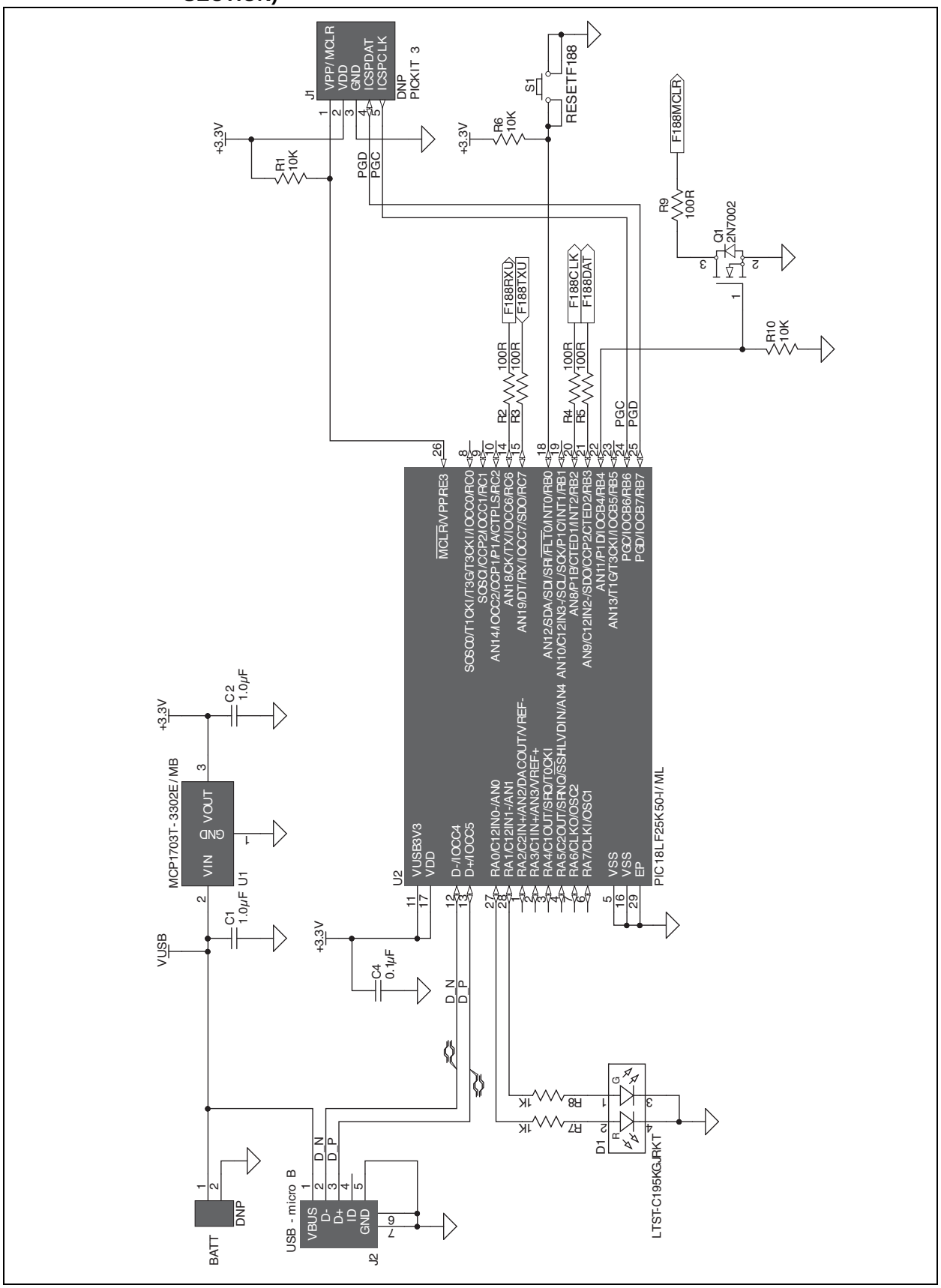


FIGURE A-2: MPLAB® XPRESS EVALUATION BOARD SCHEMATIC (PROGRAMMER SECTION)



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