

ZENA™ Wireless Adapter User's Guide

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Preface

NOTICE TO CUSTOMERS

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

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 "DSXXXXXA", where "XXXXX" 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 on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the ZENA™ Wireless Adapter. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Warranty Registration
- 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 ZENA Wireless Adapter. The manual layout is as follows:

- **Chapter 1. "Overview"** – This chapter provides a brief overview of the ZENA Wireless Adapter, including kit contents and features.
- **Chapter 2. "Getting Started"** – This chapter describes how to start using your ZENA Wireless Adapter.
- **Appendix A. "ZENA™ Wireless Adapter Construction Details"** – This appendix contains the schematics, PCB layout and Bill of Materials (BOM).

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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) { ... }`

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WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

RECOMMENDED READING

This user's guide describes how to use the ZENA Wireless Adapter. The following Microchip documents are available from the Microchip web site (www.microchip.com), and are recommended as supplemental reference resources.

MRF24J40MA 2.4 GHz IEEE Std. 802.15.4 RF Transceiver Module Data Sheet (DS70329)

MRF89XAM8A 868 MHz Ultra-Low Power Sub-GHz Transceiver Module Data Sheet (DS70651)

MRF89XAM9A 915 MHz Ultra-Low Power Sub-GHz Transceiver Module Data Sheet (DS75017)

PIC18F46J50 USB Microcontroller Data Sheet (DS39931)

MCP1700 Low Quiescent Current LDO Data Sheet (DS21826)

25LC256 256K SPI Bus Serial EEPROM Data Sheet (DS21822)

2K SPI Bus Serial EEPROM with EUI-48™ Node Identity Data Sheet (DS22123)

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- **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:

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- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB ICE 2000 and MPLAB ICE 4000.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 2.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB SIM simulator, MPLAB IDE Project Manager and general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include the MPLAB PM3 and PRO MATE® II device programmers and the PICSTART® Plus and PICkit™ 1 development programmers.

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

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DOCUMENT REVISION HISTORY

Revision A (June 2011)

- This is the initial released version of the document.

Revision B (January 2012)

This revision incorporates the following updates:

- Preface:
  - Updated **"Recommended Reading"**
- Chapters:
  - Updated Table 1-1 in **Chapter 1. "Overview"**
  - Updated the title for Figure 1-1 in **Chapter 1. "Overview"**
  - Removed the note in **2.2.2 "Installing USB Drivers"**
  - Updated the first paragraph in **2.2.2.1 "Installing the USB Driver for Windows® 2000/XP/Vista/7 OSs"**
  - Updated step 3 and step 4 in **2.2.2.1 "Installing the USB Driver for Windows® 2000/XP/Vista/7 OSs"**
  - Replaced the figure in Figure 2-5
  - Replaced the figure in Figure 2-6
  - Updated the title for Figure A-1 in **Appendix A. "ZENA™ Wireless Adapter Construction Details"**
  - Updated the title for Figure A-2 in **Appendix A. "ZENA™ Wireless Adapter Construction Details"**
  - Added Figure A-2 in **Appendix A. "ZENA™ Wireless Adapter Construction Details"**
- Minor updates related to formatting and text have been incorporated throughout the document

NOTES:

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Chapter 1. Overview

1.1 INTRODUCTION

The ZENA Wireless Adapter is a multi-function USB wireless adapter connecting USB-equipped desktop or notebook computers with Microchip wireless products for development or application uses. As a development tool, the ZENA Wireless Adapter can be used as a protocol analyzer or as a diagnostic tool. It can also be used to connect the computer as a wireless node to the network for application uses. The ZENA Wireless Adapter is capable of performing a variety of functions and each function can be programmed into the adapter using the built in USB boot loader.

Additional software and firmware updates can be downloaded from the Microchip web site: http://www.microchip.com/zena.

This chapter discusses:

- ZENA Wireless Adapter Package Contents
- ZENA Wireless Adapter Description
- Regulatory Statements

1.2 ZENA WIRELESS ADAPTER PACKAGE CONTENTS

Depending on the frequency and device type ZENA Wireless Adapter ordered, the package may contain one of the following listed in Table 1-1.

TABLE 1-1: ZENA™ WIRELESS ADAPTER

Description	Part Number
ZENA™ Wireless Adapter – 2.4 GHz MRF24J40	AC182015-1
ZENA Wireless Adapter – 868 MHz MRF89XA	AC182015-2
ZENA Wireless Adapter – 915 MHz MRF89XA	AC182015-3

1.3 ZENA WIRELESS ADAPTER DESCRIPTION

The ZENA Wireless Adapters are shown in Figure 1-1.

FIGURE 1-1: ZENA™ WIRELESS ADAPTERS



ZENA™ Wireless Adapters
(Part # AC182015-1, AC182015-2, & AC182015-3)

The ZENA Wireless Adapter plugs into the computers USB slot either directly or using an extension cable. The LED indicates operation status.

1.4 REGULATORY STATEMENTS

1.4.1 United States

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment OFF and ON. The user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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1.4.2 Canada

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

NOTES:

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Chapter 2. Getting Started

2.1 INTRODUCTION

The ZENA Wireless Adapter is a flexible, multipurpose device. Firmware applications can be updated from a computer application program such as the Wireless Development Studio.

The ZENA Wireless Adapter is pre-programmed with a MiWi™ Wireless Protocol Sniffer application. This allows the user to display MiWi Wireless Protocol packets in a graphical format in the Wireless Development Studio.

ZENA Wireless Adapter software and firmware updates can be downloaded from the Microchip web site http://www.microchip.com/zena.

2.2 INSTALLATION

2.2.1 Installing the Wireless Development Studio

The Wireless Development Studio can be downloaded from the Microchip web site: http://www.microchip.com/wds. Install the program following the installation instructions that come with the package.

2.2.2 Installing USB Drivers

The ZENA Wireless Adapter has been designed to communicate with the Microchip MPLABComm driver which is based on the libusb-win32 (for Windows) and libusb (for Mac and Linux operating systems) libraries. The USB Drivers come with the Wireless Development Studio. To install the USB drivers, follow the sections below for the operating system of choice.

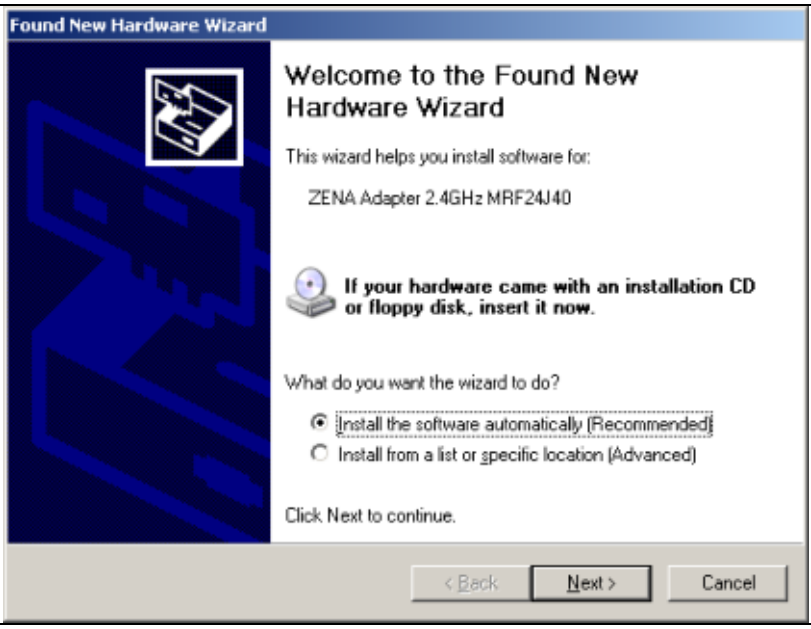
2.2.2.1 INSTALLING THE USB DRIVER FOR WINDOWS® 2000/XP/VISTA/7 OSs

To Install the USB Driver for windows, perform the following tasks:

Note:	In the following screenshots, we have used ZENA Wireless Adapter – 2.4 GHz MRF24J40. The same set of sequence is applicable for ZENA Wireless Adapter – 868 MHz MRF89XA and ZENA Wireless Adapter – 915 MHz MRF89XA.

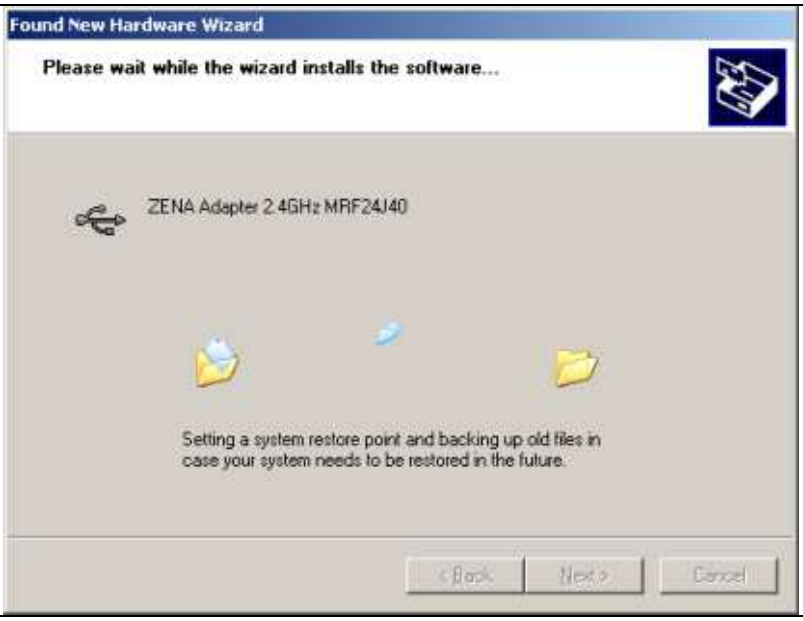
1. Plug in the ZENA Wireless Adapter into a USB port. Windows will prompt for a hardware installation as shown in Figure 2-1.

FIGURE 2-1: FOUND NEW HARDWARE WIZARD WINDOW



2. Select *Install the software automatically (Recommended)* and then click *Next*. Windows will search and install the driver automatically as shown in Figure 2-2.

FIGURE 2-2: INSTALLING THE DRIVER



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3. If Windows is unable to find the hardware for the device, then click *Back* and select *Install from a list or specific location (Advanced)*.
   a) The driver for ZENA Wireless Adapter – 2.4 GHz MRF24J40 is located in the "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 2.4 GHz MRF24J40\`" folder.

> **Note:** Default installation location for WDS on Windows is `C:\Program Files\Microchip\`

   b) The driver for ZENA Wireless Adapter – 868 MHz MRF89XA is located in the "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 868 MHz MRF89XA\`" folder.
   c) The driver for ZENA Wireless Adapter – 915 MHz MRF89XA is located in the "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 915 MHz MRF89XA\`" folder.

4. After installing the driver, if Windows prompts the following Dynamic Linked Libraries (DLLs): `WinUSBCoInstaller2.dll`, `WdfCoInstaller01009.dll` and `WUDFUpdate_01009.dll` as shown in Figure 2-3:
   a) If installing in a Windows 32-bit system, point the folder location to
   "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 2.4 GHz MRF24J40\i386\`"

   (or)

   "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 868 MHz MRF89XA\i386\`"

   (or)

   "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 915 MHz MRF89XA\i386\`"

   b) If installing in a Windows 64-bit system, point the folder location to
   "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 2.4 GHz MRF24J40\amd64\`"

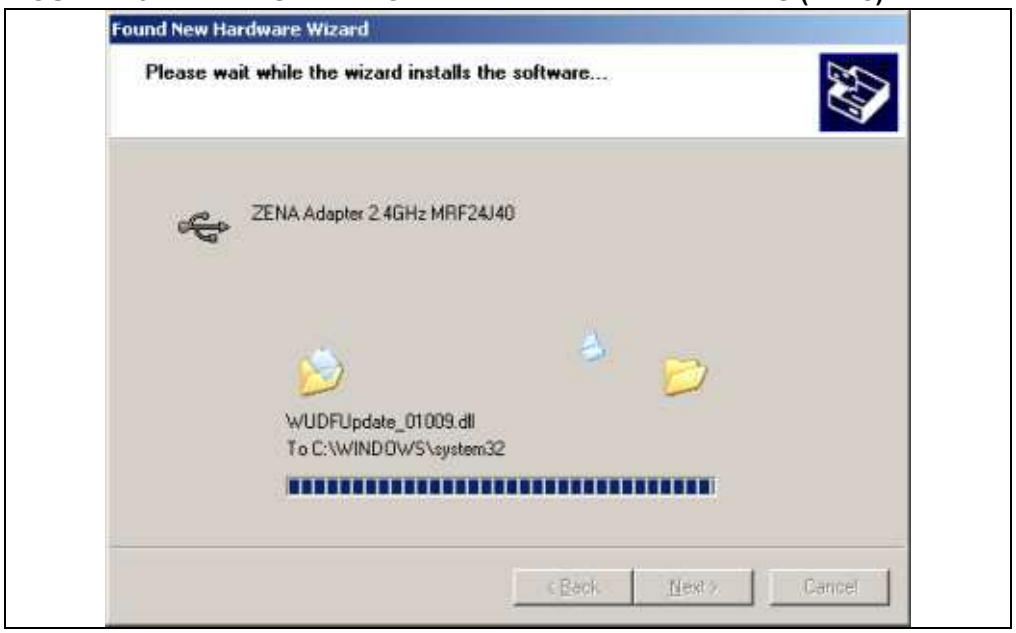
   (or)

   "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 868 MHz MRF89XA\amd64\`"

   (or)

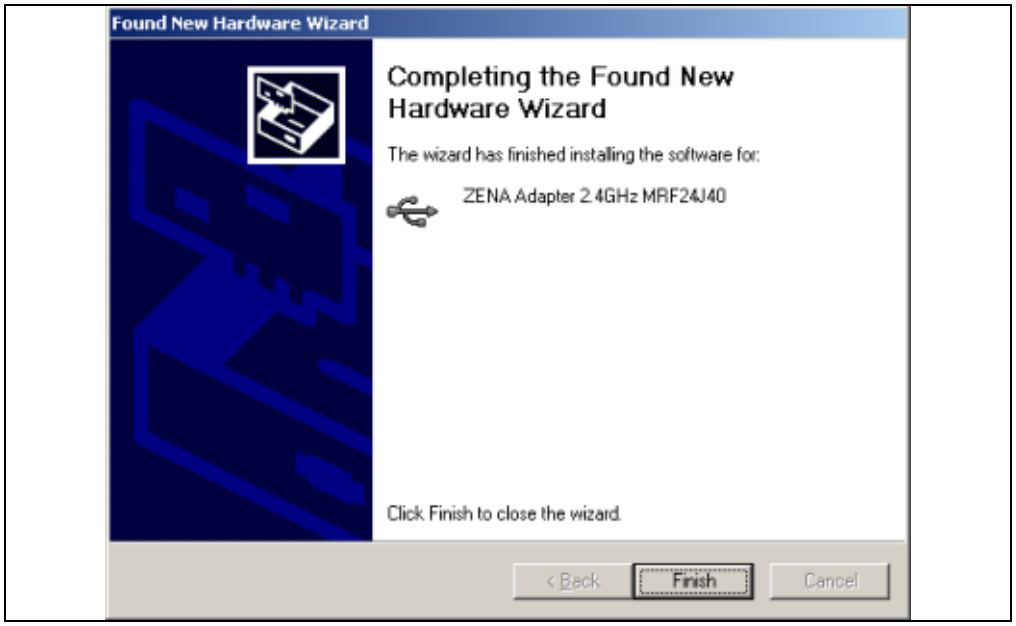
   "`Wireless Development Studio\Driver and Inf\ZENA Wireless Adapter 915 MHz MRF89XA\amd64\`"

FIGURE 2-3: INSTALLING DYNAMIC LINKED LIBRARIES (DLLs)



5. After installing the driver and DLLs, the *Completing the Found New Hardware Wizard* appears on the screen as shown in Figure 2-4.
6. Click *Finish* to complete the installation.

FIGURE 2-4: COMPLETING THE FOUND NEW HARDWARE WIZARD



2.2.2.2 INSTALLING THE USB DRIVER FOR MAC OR LINUX OSs

The ZENA Wireless Adapter uses the libUSB drivers. When installing the USB drivers on a Mac or Linux computer, the installer will place the USB drivers in the proper location.

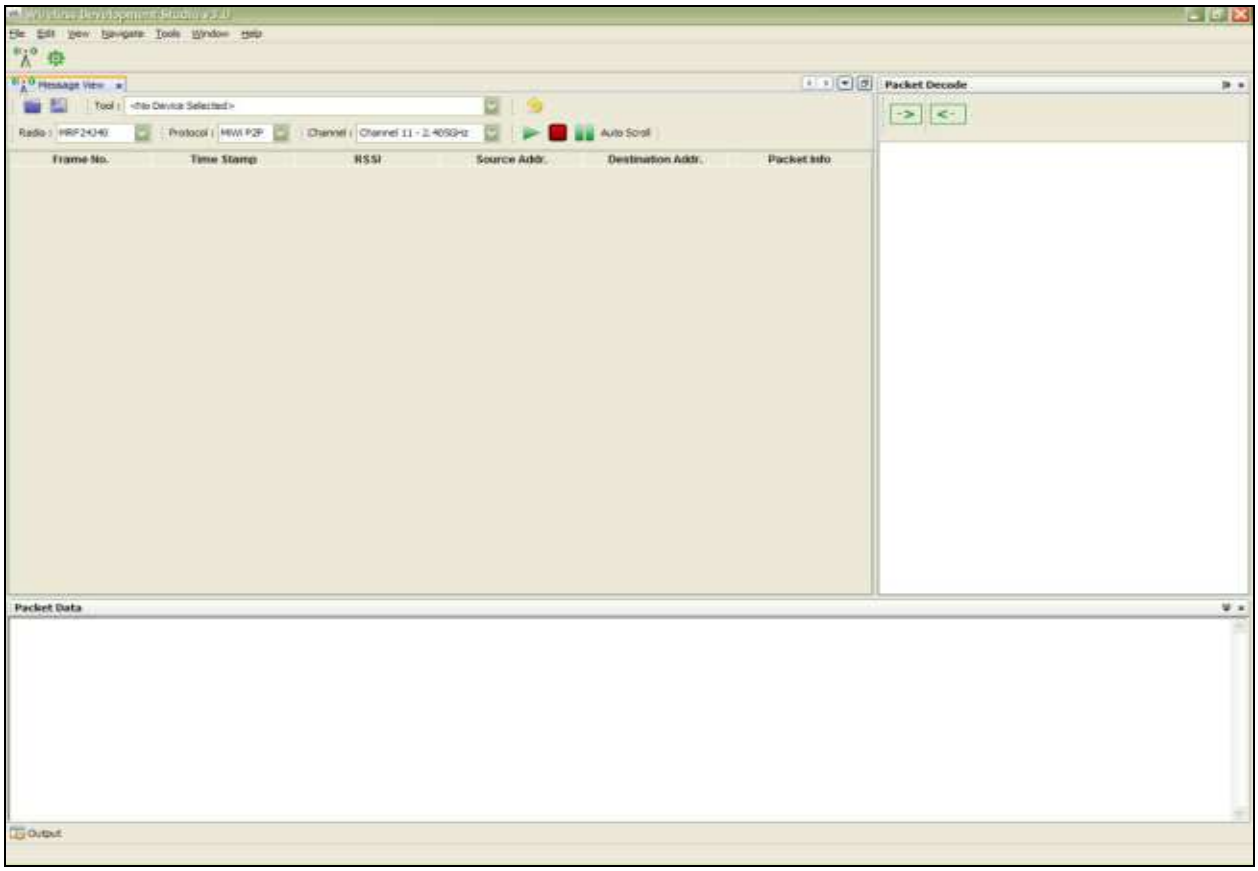
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2.3 USING ZENA WIRELESS ADAPTER WITH THE WIRELESS DEVELOPMENT STUDIO

To use the ZENA Wireless Adapter with the Wireless Development Studio, it must first be selected as the source device by performing the following tasks:

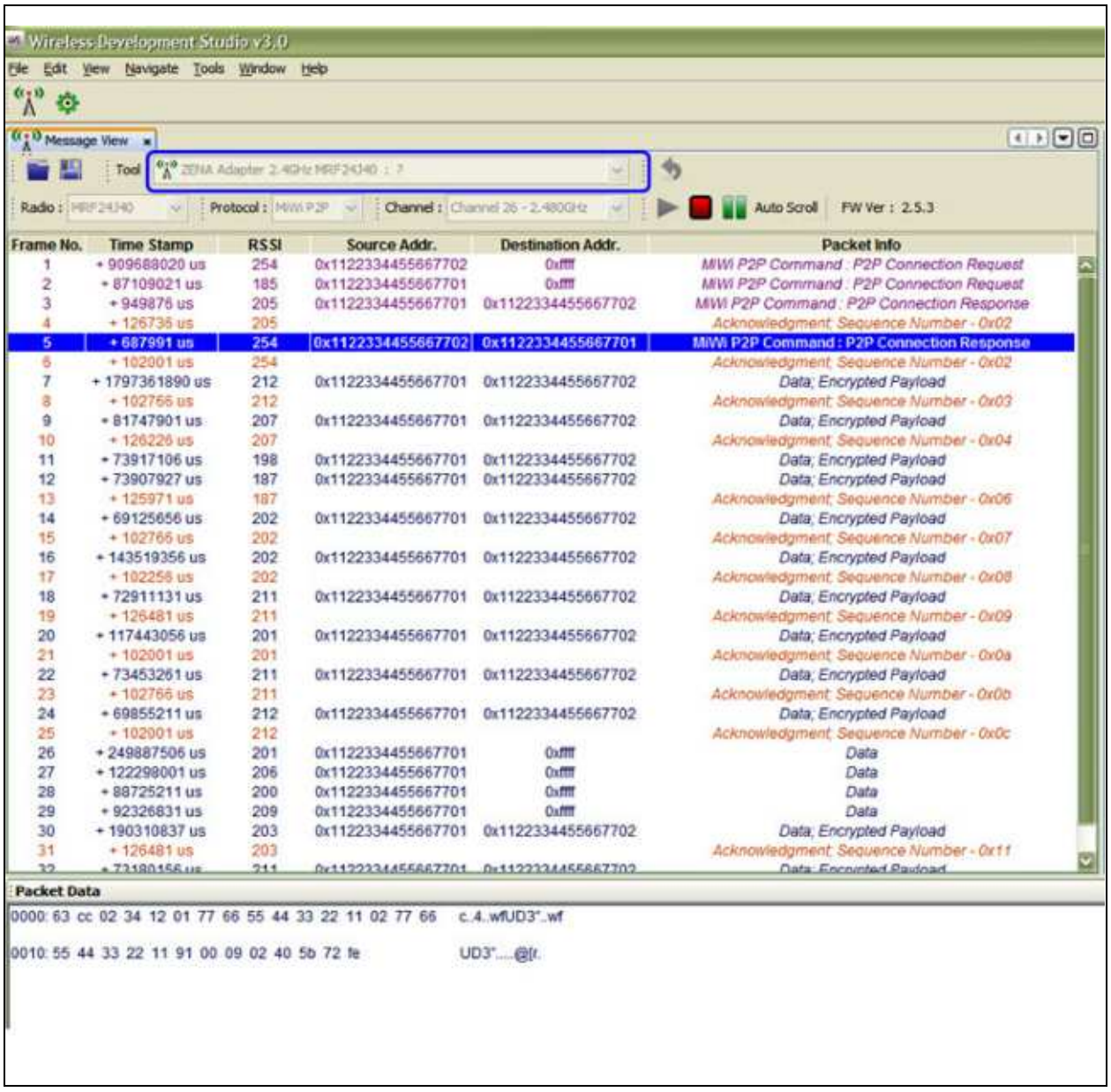
1. From the main window, select *Sniffer* as the active application, see Figure 2-5. The Packet List window will appear.

FIGURE 2-5: SNIFFER APPLICATION SELECTION



2. From the Packet List window, select *ZENA Wireless Adapter* from the Source drop-down box, see Figure 2-6.

FIGURE 2-6: WIRELESS DEVELOPMENT STUDIO SELECTION



Note: If multiple ZENA Wireless Adapters are plugged in, they can be individually chosen by serial number.

For more information on running the Wireless Development Studio, see the Wireless Development Studio help.

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Appendix A. ZENA™ Wireless Adapter Construction Details

A.1 INTRODUCTION

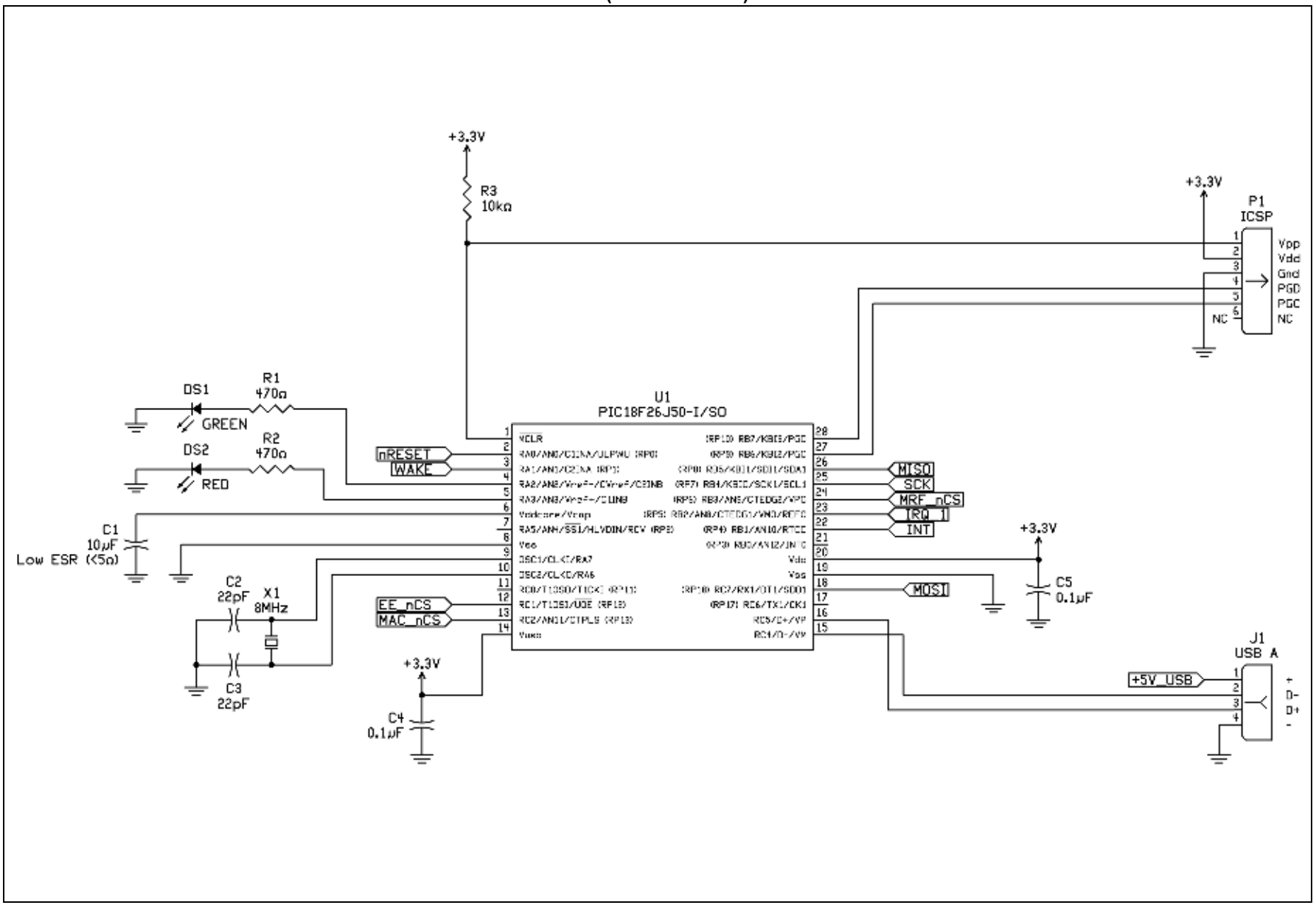
This appendix provides the ZENA Wireless Adapater schematics, PCB layout and Bill of Materials (BOM).

A.2 ZENA WIRELESS ADAPTER SCHEMATIC

Figure A-1 and Figure A-2 illustrate the ZENA Wireless Adapter schematics.

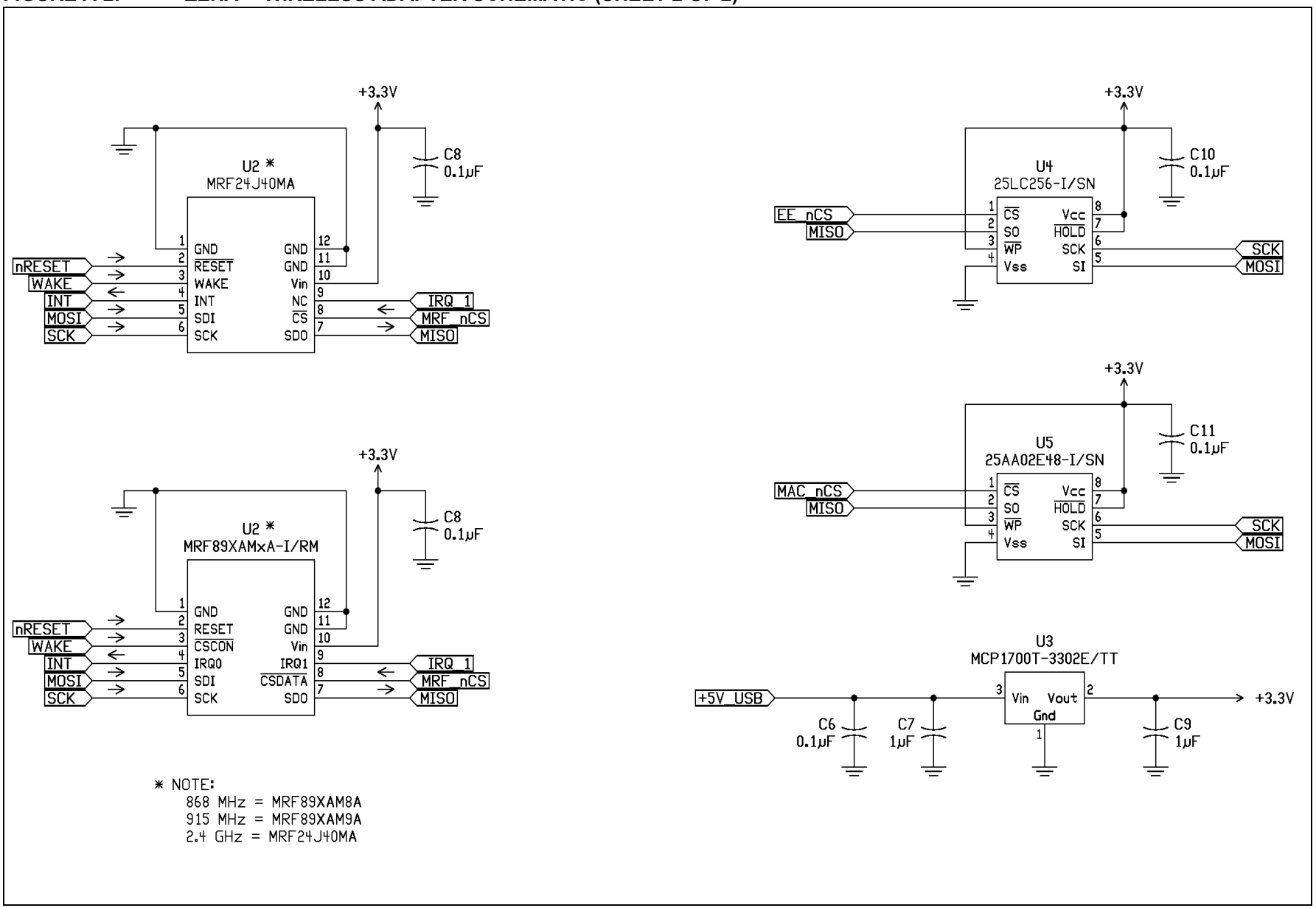
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FIGURE A-1: ZENA™ WIRELESS ADAPTER – SCHEMATIC (SHEET 1 OF 2)



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FIGURE A-2: ZENA™ WIRELESS ADAPTER SCHEMATIC (SHEET 2 OF 2)

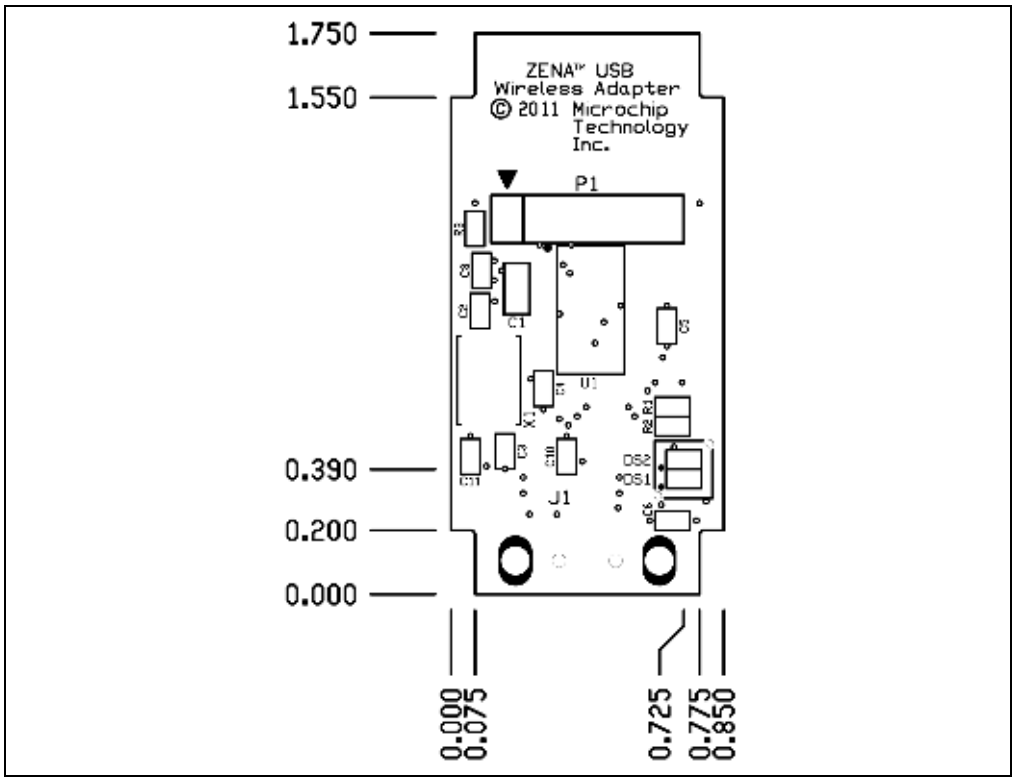


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A.3 ZENA WIRELESS ADAPTER PCB LAYOUT

The ZENA Wireless Adapter PCB is a 4-layer, high temperature FR4, 0.031 inch, plated through hole construction. Figure A-3 through Figure A-8 show the PCB layers. Figure A-3 illustrates the ZENA Wireless Adapter top silk screen.

FIGURE A-3: TOP SILK SCREEN



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Figure A-4 illustrates the ZENA Wireless Adapter top copper.

FIGURE A-4: LAYER1 — TOP COPPER

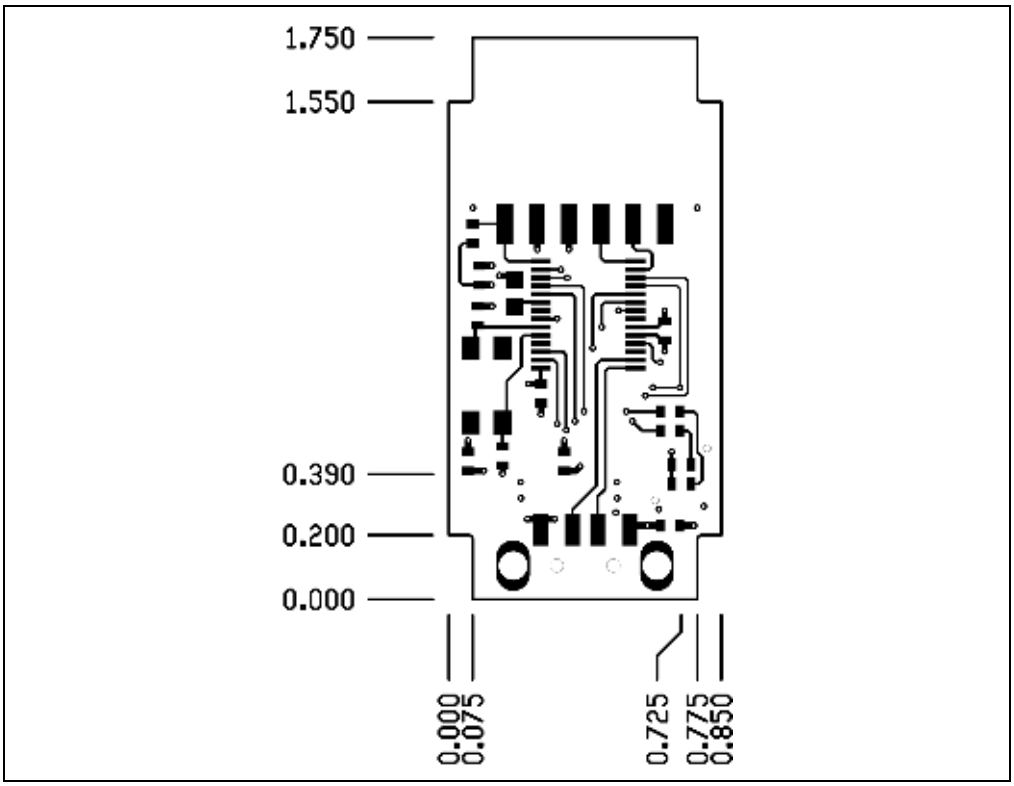


Figure A-5 illustrates the ZENA Wireless Adapter ground plane.

FIGURE A-5: LAYER 2 — GROUND PLANE

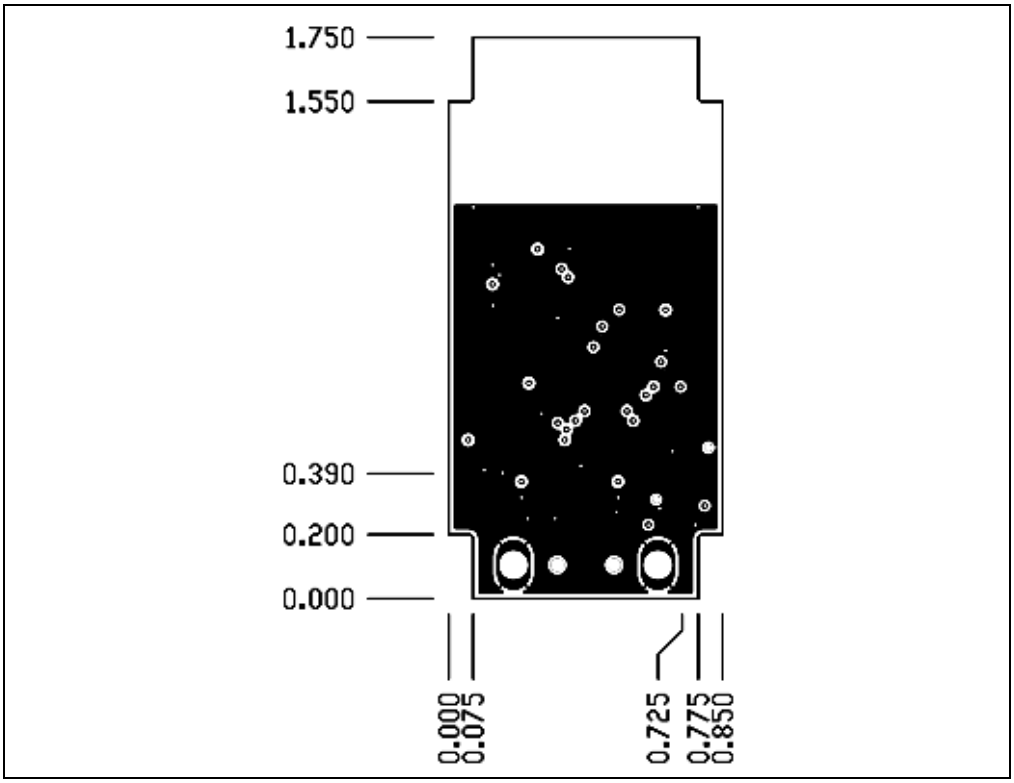


Figure A-6 illustrates the ZENA Wireless Adapter power plane.

FIGURE A-6: LAYER 3 — POWER PLANE

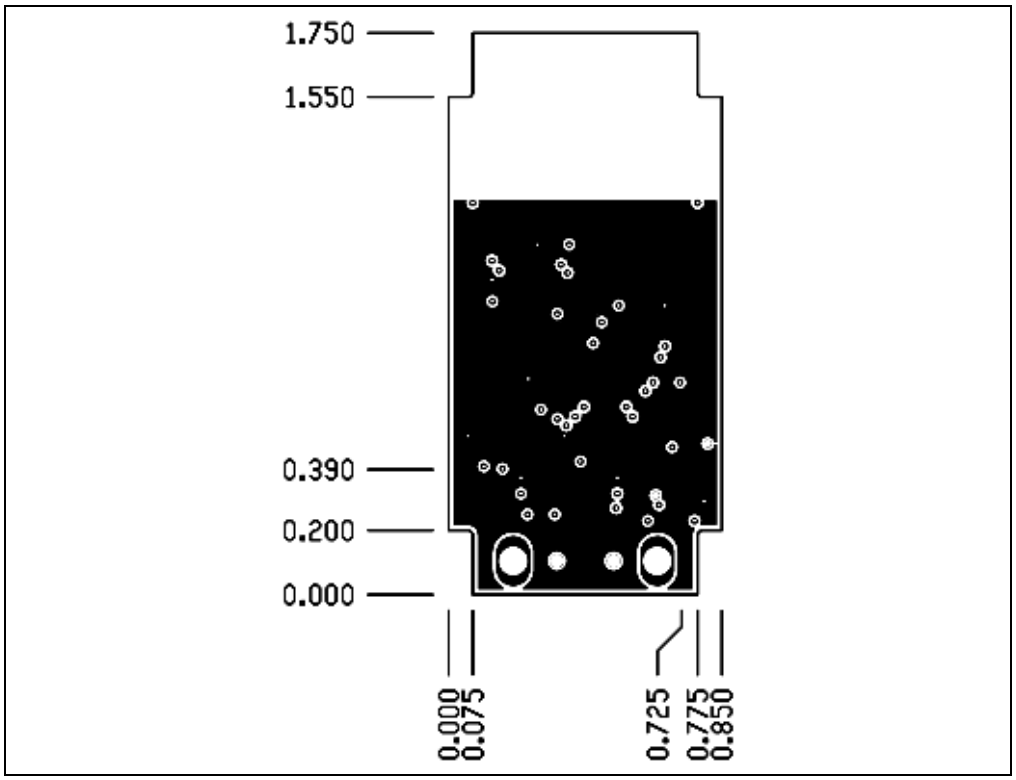
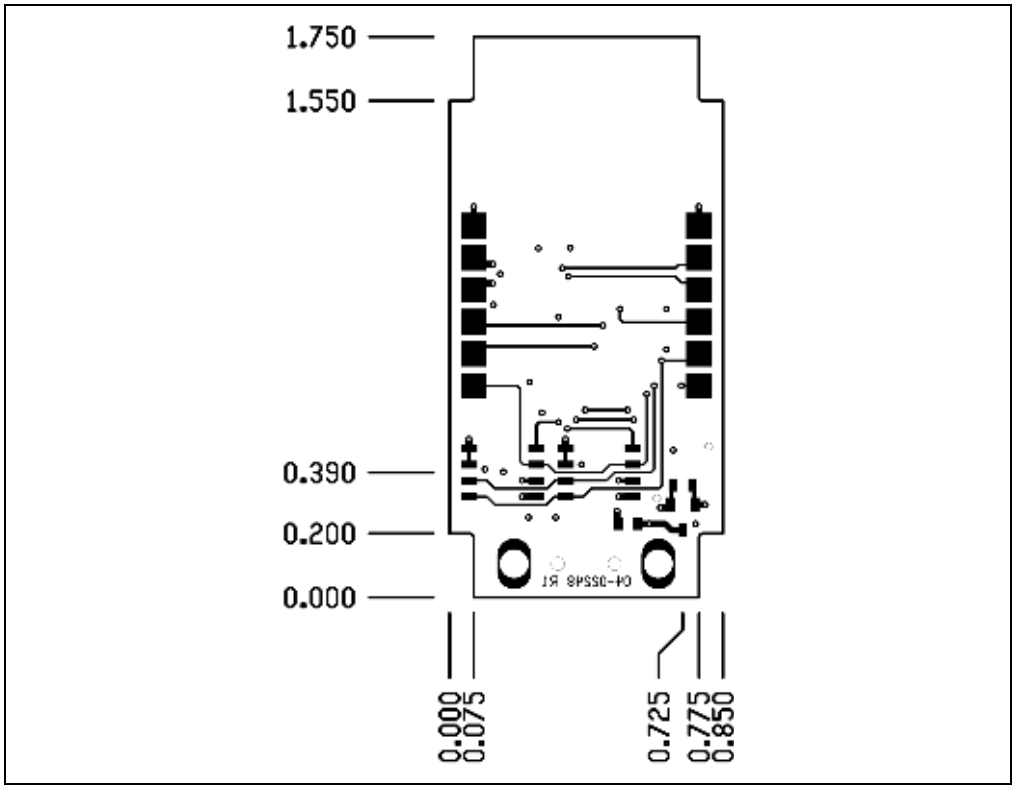


Figure A-7 illustrates the ZENA Wireless Adapter bottom copper.

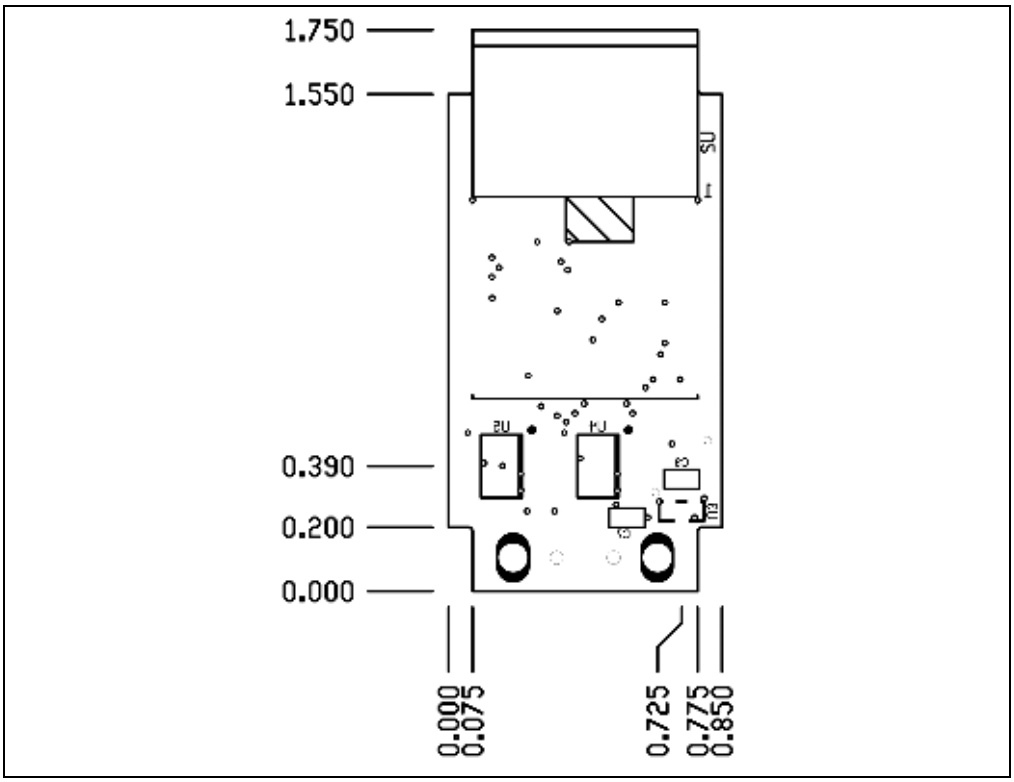
FIGURE A-7: LAYER 4 — BOTTOM COPPER



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Figure A-8 illustrates the ZENA Wireless Adapter bottom silk screen.

FIGURE A-8: BOTTOM SILK SCREEN



A.4 ZENA WIRELESS ADAPTER BILL OF MATERIALS

Table A-1 provides a detailed description of the ZENA Wireless Adapter Bill of Materials (BOM).

TABLE A-1: BILL OF MATERIALS

Qty	Designator	Value	Description	Manufacturer	Manufacturer Part Number
2	C2, C3	22 pF	Capacitor, Ceramic, SMT 0603	Murata Electronics North America	GRM1885C1H220JA01D
6	C4, C5, C6, C8, C10, C11	0.1 µF	Capacitor, Ceramic, 16V, ±10%, X7R, SMT 0603	Murata Electronics North America	GRM188R71C104KA01D
2	C7, C9	1 µF	Capacitor, Ceramic, 6.3V, ±10%, X5R, SMT 0603	Murata Electronics North America	GRM188R60J105KA01D
1	C1	10 µF	Capacitor, Ceramic, 6.3V, ±20%, X5R, SMT 0805	Murata Electronics North America	GRM21BR60J106ME19L
1	DS1	Green	Diode, Light Emitting, Green	OSRAM	LG Q971-KN-1-0-20-R18
1	DS2	Red	Diode, Light Emitting, Red	OSRAM	LS Q976-NR-1-0-20-R18
1	J1	—	Connector, Plug USB 4Pos RT Ang SMD	Molex	480371000
2	R1, R2	470 ohms	Resistor, Thin Film File, SMT 0603	Stackpole Electronics	RMCF0603JT470R
1	R3	10K ohms	Resistor, Thin Film File, SMT 0603	Stackpole Electronics	RMCF0603JT10K0
1	U1	—	PIC18F26J50-I/SS	Microchip Technology	PIC18F26J50-I/SS
1	U2 alternates: MRF89XAM8A (868 MHz) and MRF89XAM9A (915 MHz)	—	MRF24J40MA (or) MRF89XAM8A (or) MRF89XAM9A	Microchip Technology	MRF24J40MA-I/RM (or) MRF89XAM8A-I/RM (or) MRF89XAM9A-I/RM
1	U3	—	MCP1700T-3302E	Microchip Technology	MCP1700T-3302E/TT
1	U4	—	25LC256-I/SN	Microchip Technology	25LC256-I/SN
1	U5	—	25AA02E48-I/SN	Microchip Technology	25AA02E48-I/SN
1	X1	8 MHz	Crystal, SMT, 8 MHz	Abracon	ABMM-8.000MHZ-B2-T
1	@DS1 and DS2	—	Light Pipe, Vertical, 0.300" round	Bivar Inc.	VLP-300-R
1	Enclosure	—	Enclosure, USB Device	New Age Enclosures	P-201005

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