



# **Wi-Fi Comm Demo Board User's Guide**

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# Wi-Fi COMM DEMO BOARD USER'S GUIDE

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## Preface

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### 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](http://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 “DSXXXXA”, where “XXXX” 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 Wi-Fi Comm Demo Board. 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 Wi-Fi Comm Demo Board to create a Wi-Fi network and control the demo board functions from the client device web browser. The manual layout is as follows:

- **Chapter 1. “Overview”** – This chapter provides a brief overview of the demo board, highlighting its features and uses.
- **Chapter 2. “Hardware”** – This chapter provides the hardware description of the Wi-Fi Comm Demo Board.
- **Chapter 3. “Getting Started”** – This chapter describes what you need to know to start using the Wi-Fi Comm Demo Board.
- **Appendix A. “Wi-Fi Comm Demo Board Schematic”** – This appendix includes Wi-Fi Comm Demo Board schematic.

# Wi-Fi Comm Demo Board User's Guide

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

### DOCUMENTATION CONVENTIONS

Description	Represents	Examples
<b>Arial font:</b>		
Italic characters	Referenced books	<i>MPLAB<sup>®</sup> IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	<u><i>File&gt;Save</i></u>
Bold characters	A dialog button	Click <b>OK</b>
	A tab	Click the <b>Power</b> 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>
<b>Courier New font:</b>		
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	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets [ ]	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: {   }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }

## 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 Wi-Fi Comm Demo Board. The following Microchip documents are available from the Microchip web site ([www.microchip.com](http://www.microchip.com)), and are recommended as supplemental reference resources.

**MRF24WB0MA/MRF24WB0MB Data Sheet (DS70632)**

**PIC32MX5XX/6XX/7XX Family Data Sheet (DS61156)**

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Microchip provides online support via our web site at [www.microchip.com](http://www.microchip.com). This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools. These include the MPLAB<sup>®</sup> C18 and MPLAB C30 C compilers; MPASM<sup>™</sup> and MPLAB ASM30 assemblers; MPLINK<sup>™</sup> and MPLAB LINK30 object linkers; and MPLIB<sup>™</sup> and MPLAB LIB30 object librarians.
- **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<sup>®</sup> IDE** – The latest information on Microchip MPLAB IDE, the Windows<sup>®</sup> 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<sup>®</sup> II device programmers and the PICSTART<sup>®</sup> Plus and PICKit<sup>™</sup> 1 development programmers.

## CUSTOMER SUPPORT

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- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the web site at: <http://support.microchip.com>

## DOCUMENT REVISION HISTORY

### Revision A (March 2012)

This is the initial release of the document.



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## **Chapter 1. Overview**

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### **1.1 INTRODUCTION**

Thank you for purchasing the Microchip Technology's Wi-Fi Comm Demonstration kit. The Wi-Fi Comm Demo Board provides a low-cost and portable development system for Microchip's MRF24WB0MA 802.11b RF Transceiver module.

The Wi-Fi Comm Demo Board is preloaded with the demo software for the user to explore the features of the MRF24WB0MA Wi-Fi module. It is also expandable through an expansion interface, which allows the user to extend its functionality by adding various sensor expansion boards.

The topics discussed in this chapter include:

- [Wi-Fi Comm Demonstration kit Contents](#)
- [Functionality and Features](#)

### **1.2 Wi-Fi COMM DEMONSTRATION KIT CONTENTS**

The Wi-Fi Comm Demonstration Kit contains these items:

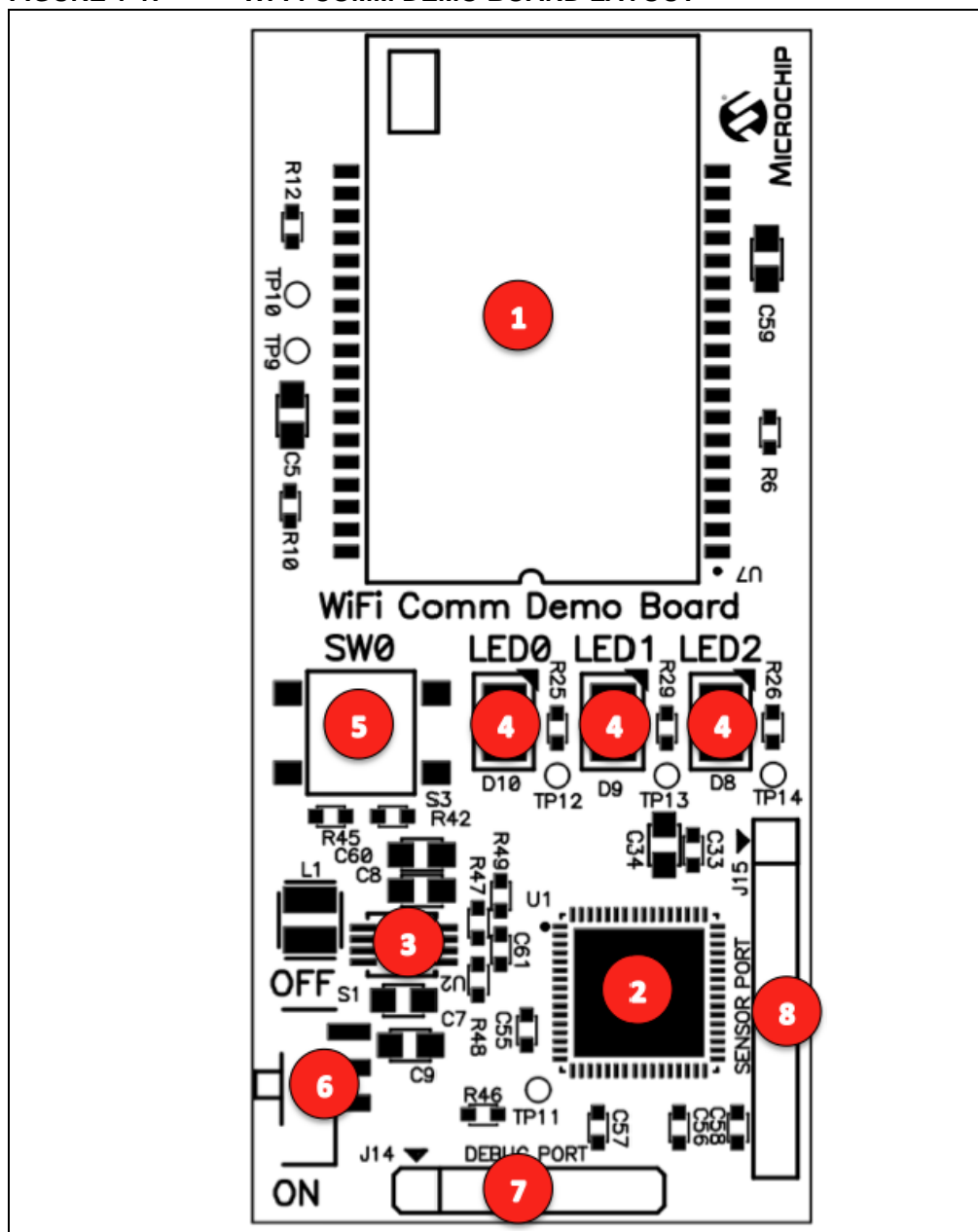
- Wi-Fi Comm Demo Board
- 2 AAA Lithium Batteries
- Wi-Fi Comm Demo Board Information Sheet

### **1.3 FUNCTIONALITY AND FEATURES**

A representation of the layout for the Wi-Fi Comm Demo Board is as shown in [Figure 1-1](#).

# Wi-Fi Comm Demo Board User's Guide

FIGURE 1-1: Wi-Fi COMM DEMO BOARD LAYOUT



The Wi-Fi Comm Demo Board includes the following key features:

1. MRF24WMB0MA RF Transceiver module
2. PIC32MX695F512H 32-bit microcontroller
3. MCP1642 +3.3V Boost regulator
4. Three status indicator LEDs
5. One push-button switch for user input
6. Power ON/OFF slider switch
7. 6-pin debug port
8. 8-pin sensor port

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## Chapter 2. Hardware

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This chapter describes the hardware features of the Wi-Fi Comm Demo Board.

### 2.1 HARDWARE FEATURES

The key features of the Wi-Fi Comm Demo Board are listed below and they are introduced in the [Section 1.3 “Functionality and Features”](#), see [Figure 1-1](#) for their locations on the board.

#### 2.1.1 Wi-Fi Transceiver

The MRF24WMB0MA RF Transceiver module provides wireless connectivity to the demo board. Host communication is through SPI2 of the PIC processor on the board.

#### 2.1.2 Processor Support

The Wi-Fi Comm Demo Board is designed with a permanently mounted (soldered) PIC32MX695F512H processor.

#### 2.1.3 Power Supply

The board is powered through 2 AAA Lithium batteries. If required, the battery voltage is monitored and boosted by the MCP1642 Synchronous Boost Regulator.

#### 2.1.4 LEDs

The LED's: LED0, LED1 and LED2 are connected to PORTE and PORTF of the PIC32MX695F512H processor. To ON the LED's, the port pins are set high.

#### 2.1.5 Switches

The Wi-Fi Comm Demo Board contains the following switches:

- S1 – Controls the main power to the board. To turn on the board, move S1 slider to the ON position.
- SW0 – Push-button switch, it is an active low switch connected to RD9 of the processor. When Idle, switch is pulled high (+3.3V) and when pressed, it is grounded.

#### 2.1.6 Debug Port

Connector J14 provides easy access to the PIC32MX695F512H processors debug pins.

#### 2.1.7 Sensor Expansion Port

Connector J15 provides access to some of the processors spare I/O pins. These pins can function as an SPI, UART, or I2C port to an attached sensor board or as general purpose I/O.

# Wi-Fi Comm Demo Board User's Guide

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## Chapter 3. Getting Started

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### 3.1 OVERVIEW

Wireless Local Area Networks (WLAN) provide a unique challenge for configuring embedded wireless products without a natural user interface. Unlike wired networks, wireless networks require unique items such as the Service Set Identifier (SSID), network type and security keys, and these items must be sent to the device in some form or another.

Generally, the user would enter this information using a keyboard and display. The Wi-Fi Comm demo application uses a mechanism called EasyConfig to allow for configuration of an embedded device on a wireless network. It utilizes the web server of the TCP/IP stack and a wireless ad hoc (independent basic service set) network to allow the user to input the desired network information from a client browser, and then reset the device to connect to the desired network.

### 3.2 RUNNING THE WI-FI COMM DEMO APPLICATION

This section describes how to connect to the Wi-Fi Comm Demo Board to control the on board LED's and view the status of the SW0 switch from a web browser. It also describes how to connect the Wi-Fi Comm Demo board to an existing network.

1. After powering, the Wi-Fi Comm Demo Board broadcasts an ad hoc network with an SSID, MCHP\_XXXX. Where, XXXX is the last four digits of the MRF24WMB0MA RF Transceiver module's MAC address (See [Example 3-1](#)).

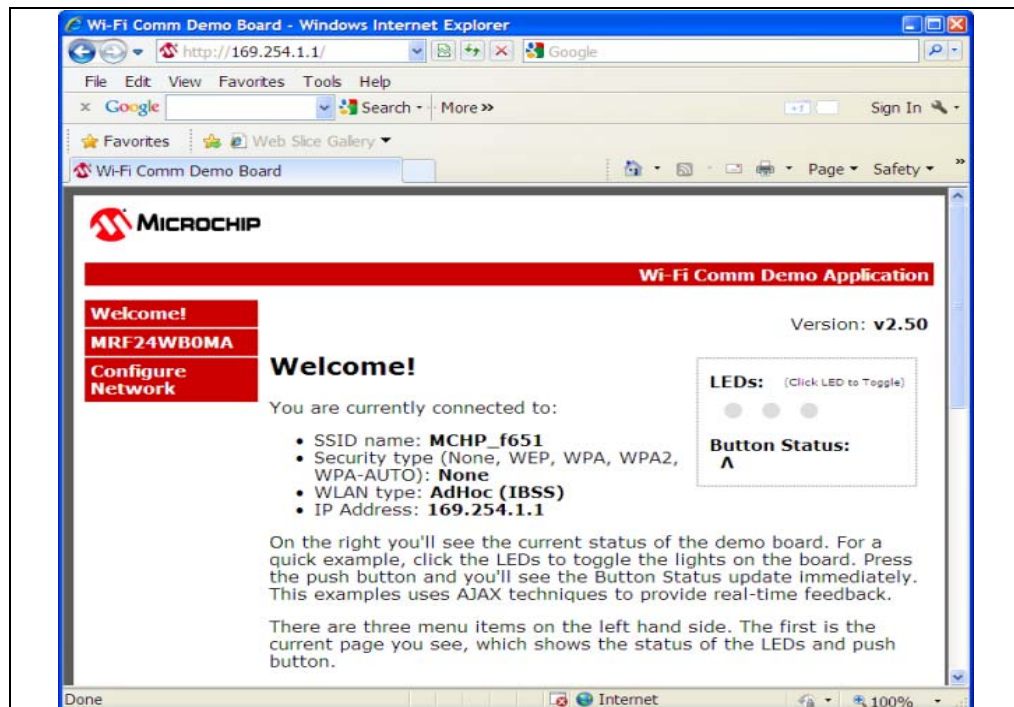
**EXAMPLE 3-1:**

MRF24WMB0MA MAC (SN): 001EC001E627 AD HOC SSID: MCHP_E627
--

2. Connect a client device, such as a laptop, iPod® Touch, iPhone®, iPad®, to the MCHP\_XXXX ad hoc network.
3. After connecting the client device, use a standard web browser and enter the IP address of the Wi-Fi Comm Demo Board. The default IP address is <http://169.254.1.1>.
4. The following web pages from the web server that is running on the Wi-Fi Comm Demo Board will be displayed.
  - a) The `index.htm` web page displays the additional information about the Wi-Fi Comm Demo Board application. It also displays the continually updating status of the three LEDs (LED0, LED1 and LED2) and push-button on the Wi-Fi Comm Demo Board, see figure [Figure 3-1](#). To control the LED's, click on the LED icon on the Web page. To see the status of the push-button, press SW0 on the Wi-Fi Comm Demo Board.

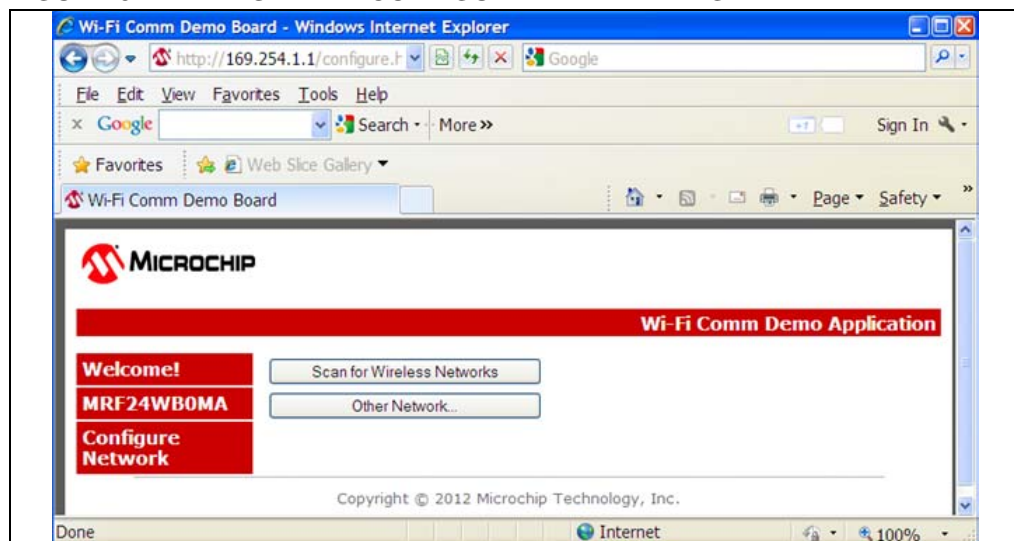
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FIGURE 3-1: SAMPLE INDEX.HTM WEB PAGE



- b) The `configure.htm` web page allows the user to scan for nearby networks and connect to the selected network, see Figure 3-2.

FIGURE 3-2: SAMPLE CONFIGURE.HTM WEB PAGE



5. To connect the Wi-Fi Comm Demo board to an existing network:  
Click **Scan for Wireless Networks** on the `configure.htm` web page.
6. When a new network is selected, the Wi-Fi Comm Demo Board will reset automatically using the parameters (SSID, security key) of the new network.
7. To continue using the demo, the client device must be reconnected to the same network where Wi-Fi Comm Demo Board is on.

**Note:** The demo board will always attempt to connect to the last known network. If the user wants to reset the demo to startup in ad hoc mode again, then simply slide the power switch S1 to the OFF position and then back to the ON position.

## 3.3 AD HOC NETWORKS

On starting the demo, the product will either connect to another ad hoc network or will start its own if ad hoc network is not found. Ad hoc networks are peer-to-peer networks with no centralized coordinator for the network; all the devices share the responsibilities of keeping the network running. One downfall of ad hoc networks is that typically security is not employed on them.

The MRF24WB0M module can secure an ad hoc network with Wired Equivalent Privacy (WEP) (40-bit/104-bit) security, like most of the laptops and ad hoc devices. Very few devices in the market can secure an ad hoc network with Wi-Fi Protected Access (WPA) level security due to tremendous overhead.

The demo starts on an ad hoc network without security. This means that all the network information that is being configured on the device is going over-the-air in the open. For most applications, unless somebody is specifically attempting to listen in on this network, there should be minor impact on security. However, for applications that require baseline level of security, WEP can be employed on the network.

## 3.4 ZERO CONFIGURATION/BONJOUR

Zero Configuration (Zeroconf) provides a mechanism to simplify the device configuration on a network. The term Zeroconf is titled from the names Bonjour (Apple) and Avahi (Linux), and is an Internet Engineering Task Force (IETF) standard. Zeroconf provides simplified naming conventions, instead of relying on the IP addresses alone. The Zeroconf is built on the following three core technologies.

### 3.4.1 Link Local

The first component of Zeroconf is the ability to self-assign an IP address to each member of a network. Usually, a Dynamic Host Configuration Protocol (DHCP) server handles such situations. However, when no DHCP server exists, Zeroconf enabled devices negotiate the unique IP address amongst themselves.

### 3.4.2 Multicast DNS

The second component of Zeroconf is the ability to self-assign the host names. Multicast Domain Name System (DNS) provides the local network with the ability to have the features of a DNS server. User can use the host names to access the devices on the network. When devices select to use the same host name, as in the IP address resolution, each of the devices will self-assign the Auto-negotiate New Names, usually appending a number at the end of the name.

### 3.4.3 Service Discovery

The last component of Zeroconf is service discovery. All Zeroconf devices can broadcast what services they provide. For instance, a printer can broadcast about available printing services. A thermostat can broadcast that it has an HVAC control service. For a specific service, the user can see the list of devices that provide the service, and connect to it. This eliminates the need to know whether something exists on a network (and what its IP or host name is). The user can query the network to see if a certain service exists or not, and easily connect to it.

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## 3.5 CONFIGURED VS. UNCONFIGURED STATE

When the Wi-Fi Comm demo is in an unconfigured state (i.e, serving the default MCHP\_XXXX SSID in ad hoc mode), the LED (LED0) will blink twice per second to indicate it is not configured. After the network is configured, the LED will blink once per second.

**Note:** When the Wi-Fi Comm Demo Board is moved to a different network, a new IP address will be assigned to it. As the Wi-Fi Comm Demo Board does not display the new IP address, the user must obtain the new IP address from the server that assigned it. Refer to your server's documentation for the necessary steps required to obtain the new IP address.





# Wi-Fi COMM DEMO BOARD USER'S GUIDE

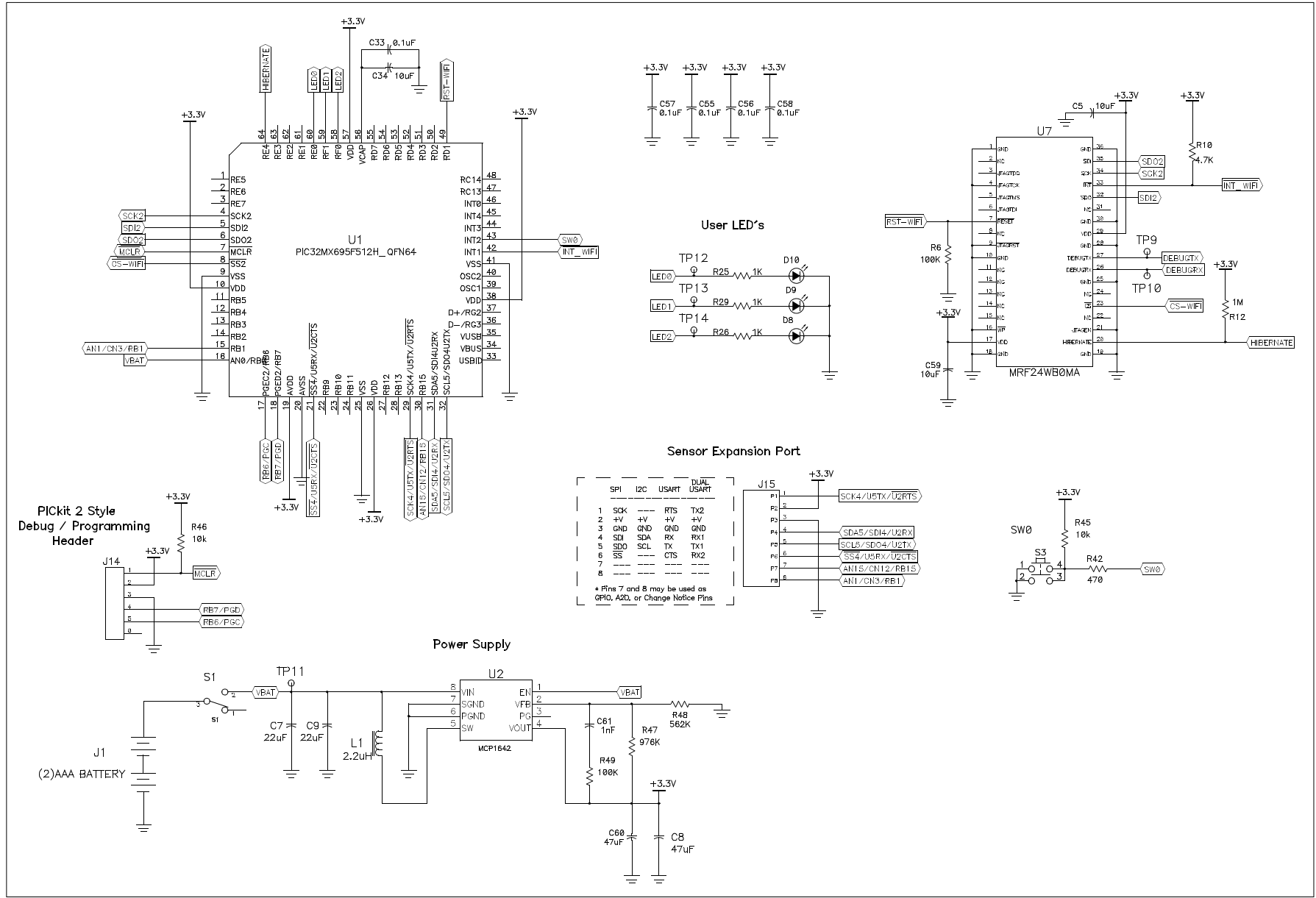
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## Appendix A. Wi-Fi Comm Demo Board Schematic

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### A.1 INTRODUCTION

This appendix provides the Wi-Fi Comm Demo Board schematic.

**FIGURE A-1: Wi-Fi COMM DEMO BOARD SCHEMATIC**

# Wi-Fi Comm Demo Board Schematic

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NOTES:

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