Wi-Fi Comm Demo Board
User's Guide

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Preface

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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.

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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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), and are recommended as supplemental reference resources.

MRF24WB0MA/MRF24WB0MB Data Sheet (DS70632)

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

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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.
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- Technical Support

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DOCUMENT REVISION HISTORY

Revision A (March 2012)

This is the initial release of the document.

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Chapter 1. Overview

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 Demostration kit Contents
- Functionality and Features

1.2 Wi-Fi COMM DEMOSTRATION 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.

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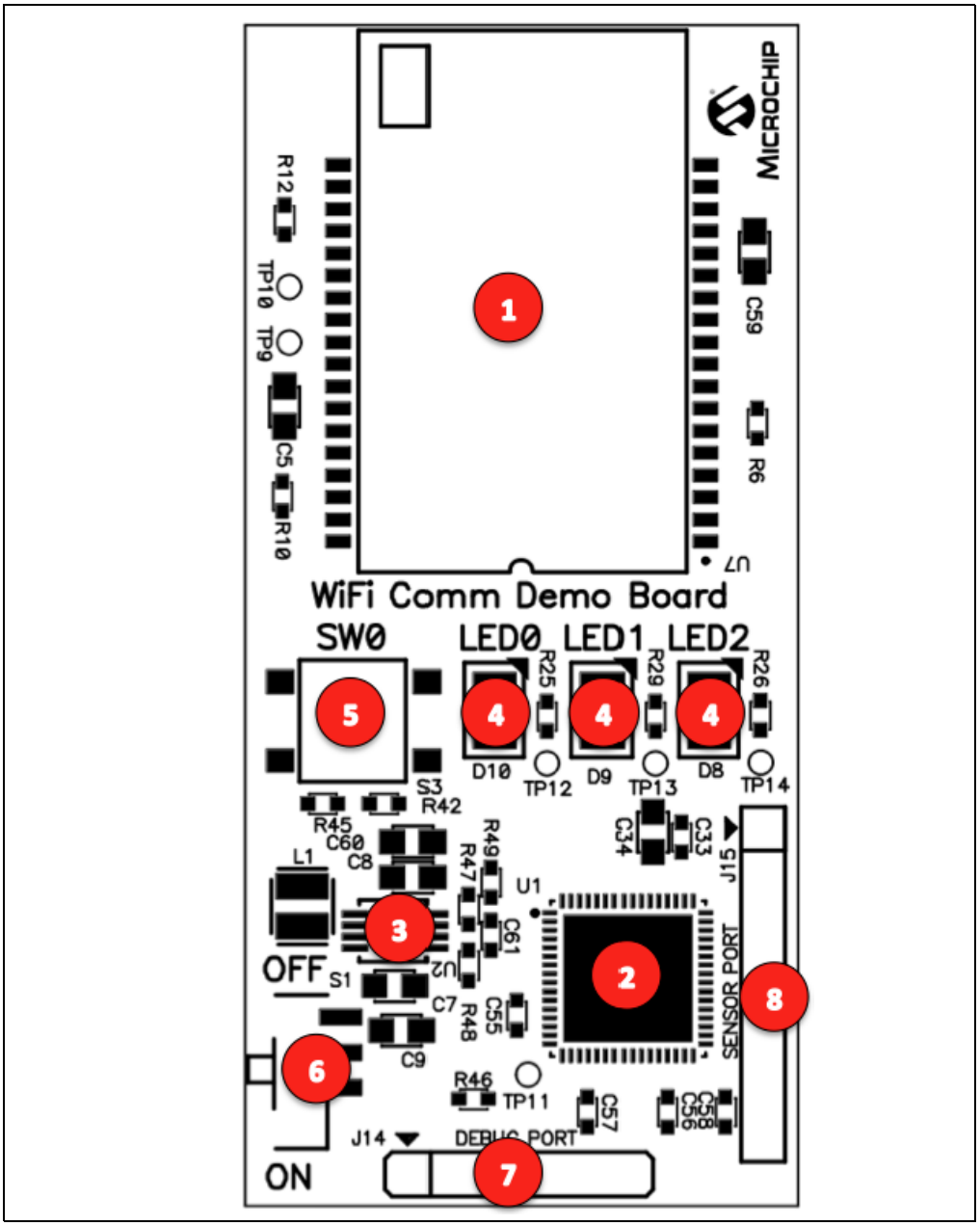
FIGURE 1-1: Wi-Fi COMM DEMO BOARD LAYOUT



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

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.

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Chapter 3. Getting Started

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).

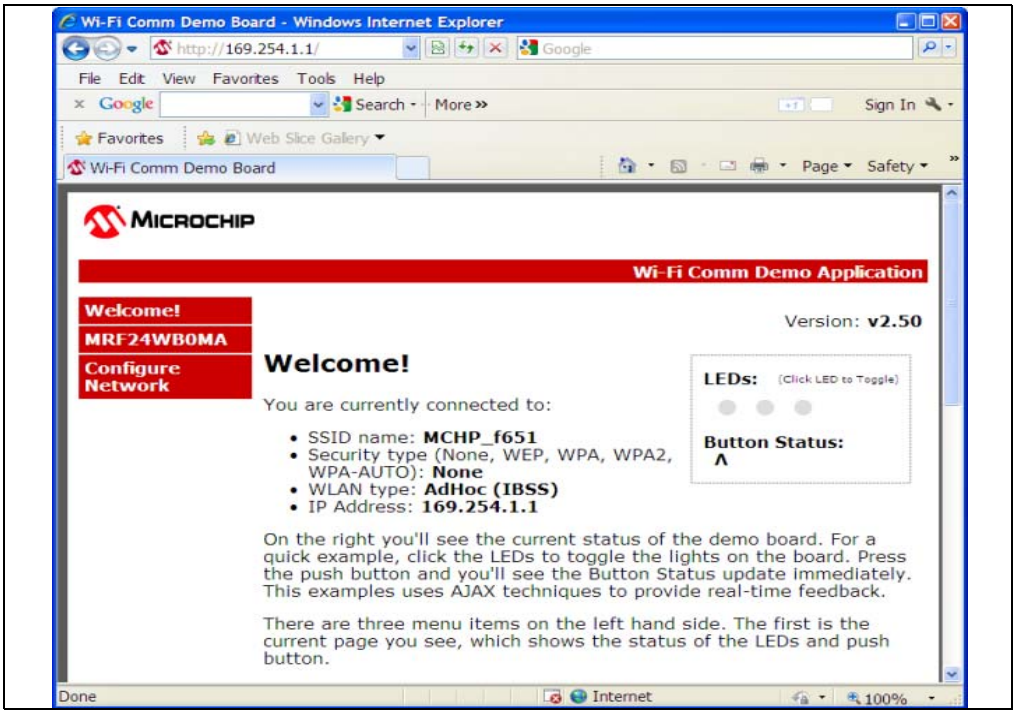
EXAMPLE 3-1:

```
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.

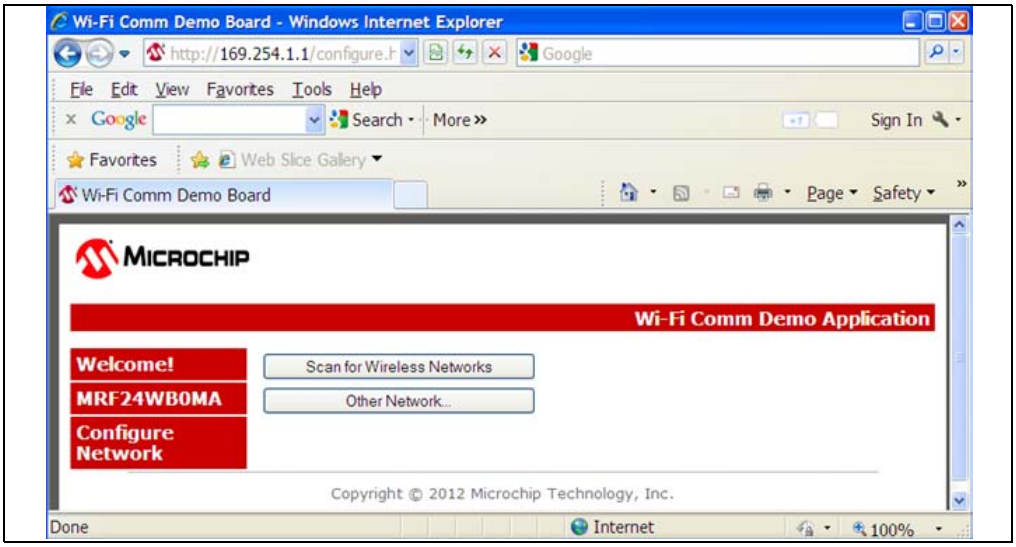
a) `The index.htm` web page displays the additional information about the Wi-Fi Comm Demo Board application. It also displays the continually updating status of the three LEDs (LED0, LED1 and LED2) and push-button on the Wi-Fi Comm Demo Board, see figure Figure 3-1. To control the LED's, click on the LED icon on the Web page. To see the status of the push-button, press SW0 on the Wi-Fi Comm Demo Board.

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.

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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 it's 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.

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.

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Appendix A. Wi-Fi Comm Demo Board Schematic

A.1 INTRODUCTION

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

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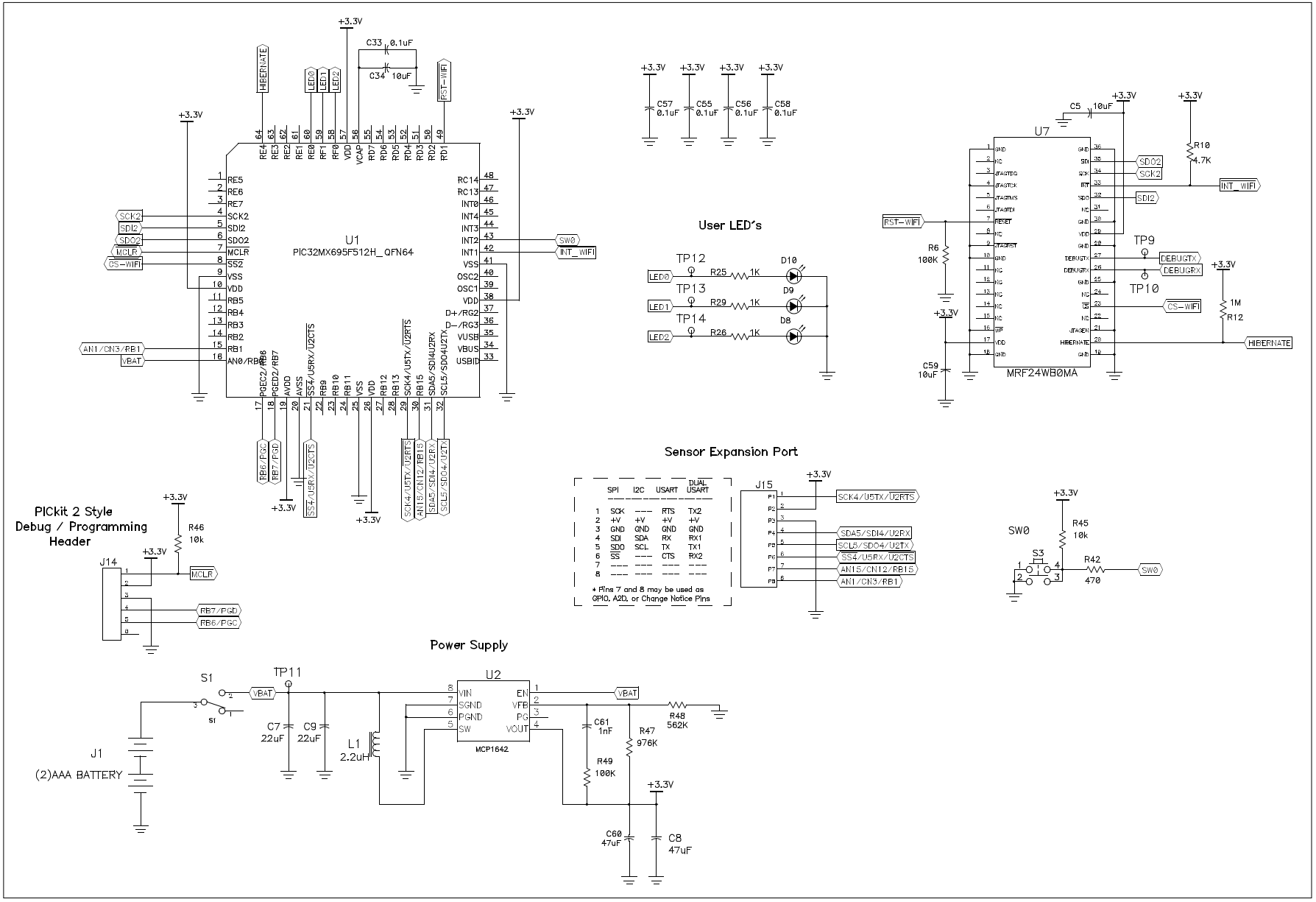
FIGURE A-1: Wi-Fi COMM DEMO BOARD SCHEMATIC



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Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

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