chipKIT™ WiFi Shield Reference Manual

Revision: February 7, 2013
Note: This document applies to REV C of the board.

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Overview

The chipKIT™ WiFi Shield is an interface board designed for use with Digilent's chipKIT line of microcontroller boards such as the Uno32™, uC32™, or Max32™. The chipKIT line is a family of microcontroller boards based on the high performance Microchip PIC32 family of microcontrollers.

The chipKIT WiFi Shield provides chipKIT microcontroller boards the ability to connect to and communicate with IEEE 802.11 compatible wireless networks.

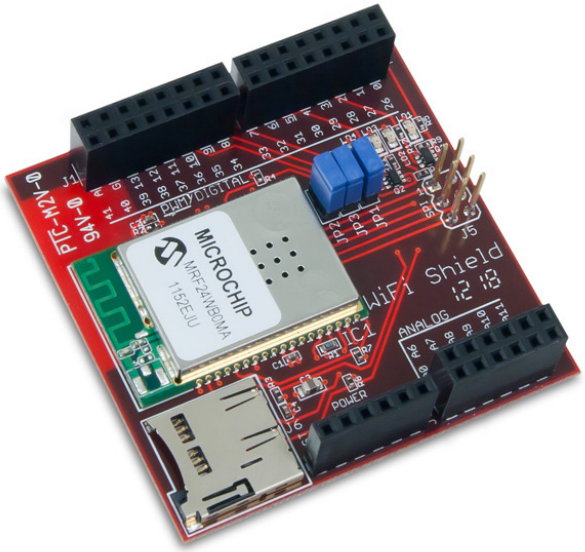
The WiFi Shield also provides a micro-SD card connector for use with micro-SD flash memory cards. The chipKIT MPIDE SD library can be used to read/write files stored on the micro-SD card.

The WiFi Shield is intended for use with the Digilent network libraries, DNETcK and DWIFIcK, available for free download from the Digilent web site. These libraries make use of and include a custom version of the Microchip Applications Library licensed from Microchip.

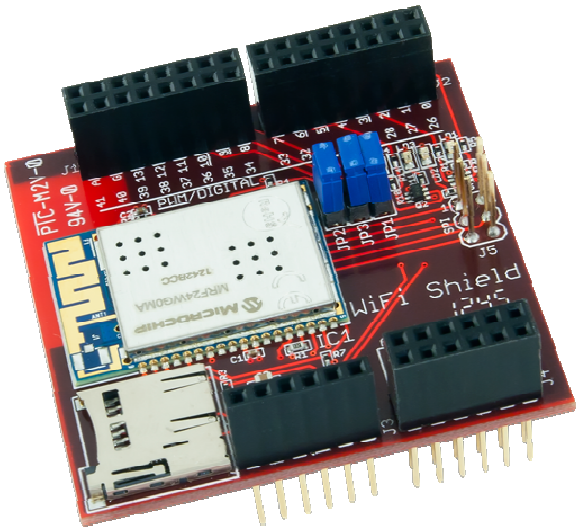
Early versions of the WiFi Shield use the Microchip MRF24WB0MA WiFi module. Later versions use the improved MRF24WG0MA WiFi module.

Features include:

- IEEE 802.11b/g-compliant RF transceiver
- serialized unique MAC address
- data rates up to 11Mbps for 802.11b and 54Mbps for 802.11g possible
- WEP, WPA-PSK, WPA2-PSK security
- integrated PCB antenna
- radio regulation certification for the United States (FCC), Canada (IC), and Europe (ETSI)
- micro SD card connector
- four user accessible LEDs



chipKIT WiFi Shield with MRF24WB0MA WiFi Module



chipKIT WiFi Shield with MRF24WG0MA WiFi Module

Functional Description

Overview

Depending on the production version, the chipKIT WiFi Shield provides support for either IEEE 802.11b or IEEE 802.11b/g wireless networks. It is compatible with 802.11b/g/n networks, and is designed for use with chipKIT™ and chipKIT™ compatible microcontroller boards.

The initial production version of the WiFi Shield uses the Microchip MRF24WB0MA WiFi module. This modules supports IEEE 802.11b networks at 1 and 2 Mbps data rates.

Later productions versions of the WiFi Shield use the improved Microchip MRF24WG0MA module. This module provides IEEE 802.11b/g support for embedded applications at data rates of 1, 2, 5.5 and 11 Mbps for 802.11b or 6, 9, 12, 18, 24, 36, 48, and 54 Mbps for 802.11g.

The production version of the board can be determined by reading the part number of the MRF24Wx0MA module from the sticker or engraved on the metal shield of the module.

The WiFi Shield is intended to be used with the Digilent network libraries, DNETcK and DWIFIcK, available for free download from the Digilent web site. The DNETcK and DWIFIcK libraries are intended for use with the chipKIT MPIDE development environment. These libraries contain Microchip Applications Library code licensed for use by Digilent from Microchip.

To use the chipKIT WiFi Shield outside of the MPIDE development environment, the Microchip Applications Library, available from www.microchip.com, can be used as a starting point to create custom library code to work with the WiFi Shield.

The WiFi shield also provides a micro-SD card connector and four discrete LEDs. The micro-SD card connector provides the ability to access files stored on a micro-SD size flash memory card using the chipKIT MPIDE SD library.

The discrete LEDs are connected to four digital I/O pins on the chipKIT microcontroller board and can be accessed using the `pinMode()` and `digitalWrite()` functions in the MPIDE software.

Refer to the chipKit WiFi Shield schematic, available on the Digilent web site, for detailed information about the circuits on the board.

802.11b/g Interface

The 802.11b/g compatible WiFi interface on the chipKIT WiFi Shield is provided by a Microchip MRF24Wx0MA WiFi module. This module provides the radio transceiver, antenna, and 802.11 compatible network firmware.

The MRF24Wx0MA firmware provides the 802.11 network protocol software support. The DNETcK and DWIFIcK libraries provide the TCP/IP network protocol support that works with the 802.11 protocol support provided by the WiFi module.

The primary communications interface with the WiFi module is a 4 wire SPI bus. The MRF24Wx0MA WiFi module supports SPI clock speeds up to 25MHz. An active low RESET signal can be used to reset the WiFi module, and an external interrupt signal, INT, is used by the module to signal to the host microcontroller that it needs servicing by the microcontroller software.

The MRF24Wx0MA provides the following additional control signals: write protect (WP); HIBERNATE; RESET; and INT.

More detailed information about the operation of the MRF24Wx0MA can be obtained from the manufacturer data sheet available from the Microchip web site.

SD Card Interface

The micro-SD card connector provides the ability to access data stored on micro-SD sized flash memory cards.

SD memory cards are accessed via the same SPI bus as is used to access the WiFi module. The SD card uses a separate select line from that used by the WiFi module to enable API access to the SD card. The chipKIT MPIDE SD library can be used to access files stored on a micro-SD card.

Library Software

The chipKIT WiFi Shield is intended for use with the Digilent chipKIT network libraries DNETcK and DWIFIcK. The DNETcK library provides TCP/IP protocol support for all chipKIT compatible network interfaces supported by Digilent products, including the WiFi Shield. The DWIFIcK library provides the additional library support required for connecting to and operating with the Microchip MRF24Wx0MA wireless network modules.

The DWIFIcK library supports both the MRF24WB0MA and MRF24WG0MA modules. The correct header file must be used depending on the version of the module on the WiFi Shield.

When using a WiFi Shield with the MRF24WB0MA module, use the following statement:

```
#include <WiFiShieldOrPmodWiFi.h>
```

When using a WiFi Shield with the MRF24WG0MA module, use the following statement:

```
#include <WiFiShieldOrPmodWiFi_G.h>
```

The Digilent chipKIT network libraries are available for download from the Digilent web site: www.digilentinc.com. These libraries make use of a custom version of the Microchip Application Library. It is necessary to accept the Microchip Application Library license agreement before downloading the library.

There are reference examples demonstrating the use of these libraries in the library download. There are more extensive examples available on the Digilent web site as well.

Signal Pin Assignments

uC32/ Uno32 Pin #	Max32 Pin #	Connector Pin #	Signal
2	2	J2-05	INT – external interrupt from MRF24WB0MA
3	3	J2-07	LED1
4	4	J2-09	SDCS – SPI select for SD card
5	5	J2-11	LED2
6	6	J2-13	LED3
9	9	J1-03	LED4
10	10	J5-05	CS – SPI select for MRF24Wx0MA
11	11	J5-04	MOSI – data in (SDI) for MRF24Wx0MA and SD card
12	12	J5-01	MISO – data out (SDO) for MRF24Wx0MA and SD card
13	13	J5-03	SCK – SPI clock for MRF24Wx0MA and SD card
34	78	J1-02	HIBERNATE
35	79	J1-04	WP
36	80	J1-06	RESET

Declaration of Conformity

In accordance with EN ISO/IEC 17050-1:2010

Manufacturers Name:	Digilent, Inc.
Manufacturers Address:	1300 NE Henley Court Pullman, WA 99163 U.S.A.

Application of Council Directives:

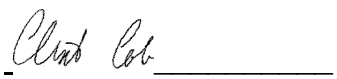
Low Voltage	2006/95/EC
EMC	2004/108/EC

Standards:

EMC	EN55022:2010 EN55024:2010
Safety	IEC 60950-1:2005 EN 60950-1:2006

Product Name:	chipKIT WiFi Shield
Product Model Number:	Digilent P/N 210-231
Digilent Product Category:	Serial Peripheral Devices

We, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Location:	Pullman, WA	Signature:	
Date:	June 18, 2012	Full Name (print):	Clint Cole
		Title:	President

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