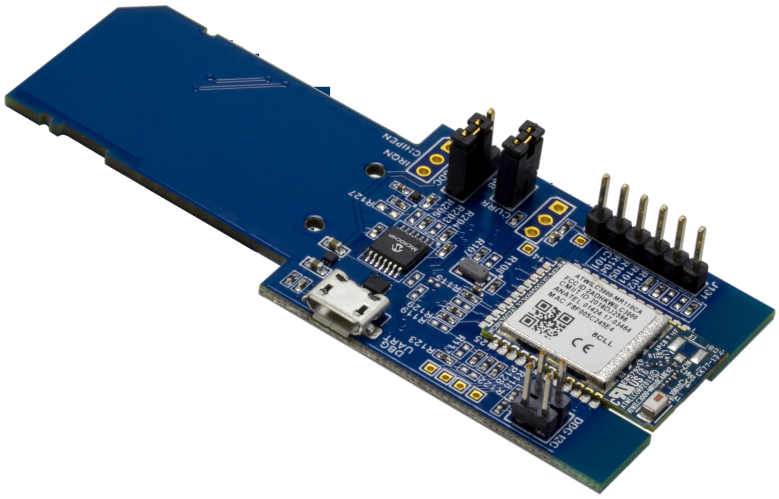
WILC3000 SD

Wi-Fi® Link Controller Secure Digital Card Interface User's Guide

Introduction

The WILC3000 SD is a Secure Digital (SD) card interface board that supports IEEE® 802.11 b/g/n standard and Bluetooth® Low Energy (BLE) 5.0, and is designed to demonstrate the features of the low-power consumption ATWILC3000-MR110CA IoT (Internet of Things) module.

Figure 1. WILC3000 SD Board



Features

- ATWILC3000-MR110CA Low-Power Consumption 802.11 b/g/n IoT Module
  - Single chip IEEE 802.11 b/g/n RF/Baseband/MAC link controller and Bluetooth 5.0 optimized for low-power mobile applications
  - Chip antenna

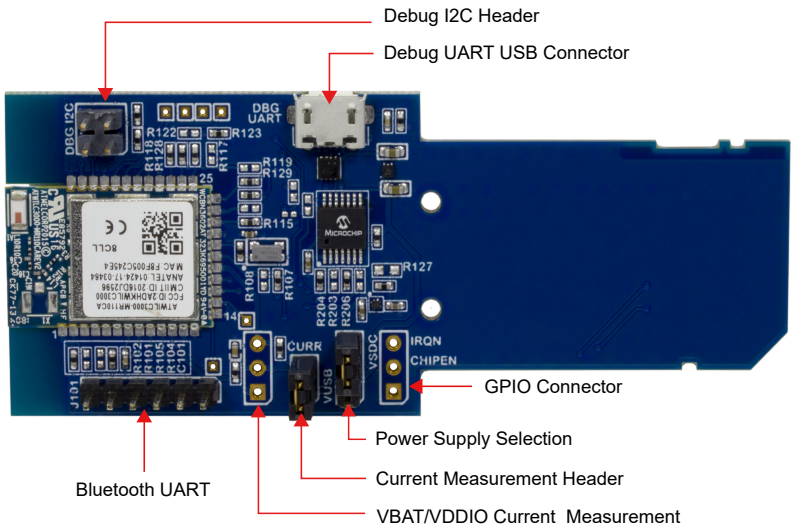
- Debug I2C Header
- On-Board USB to Debug UART Converter Using Microchip MCP2221A
- Current Measurement Header
- Optional Current Measurement Header for V_{BAT} and VDDIO
- 32.768 kHz Low-Power SMD Crystal Oscillator
- MMCplus/SD Card Connector for Controlling ATWILC3000 Module using SDIO Interface
- Optional SPI Connection to MMCplus/SD Card Interface for Controlling ATWILC3000 Module
- Bluetooth UART Header
- GPIO Connector for IRQ, CHIP EN, and RESETN
- Power Supply from SD/MMCplus Connector or USB

Table of Contents

1. Kit Overview

The WILC3000 SD is an extension board containing the ultra-low power ATWILC3000-MR110CA IoT module. This board can be connected to any host microcontroller (MCU) board with Secure Digital Input/ Output (SDIO) or Multimedia Card plus (MMCplus) via on-board MMCplus card connector using either SDIO/SPI for controlling Wi-Fi. For controlling the Bluetooth of the ATWILC3000 module, Bluetooth UART should be connected to the host MCU using the Bluetooth Header.

Figure 1-1. WILC3000 SD Interfaces



1.1 Design Documentation and Relevant Links

The following list contains links to the documentation and software available for the WILC3000 SD board:

- **Xplained Pro products** is a series of small-sized and easy-to-use evaluation kits for microcontrollers and other products. It consists of a series of low-cost MCU boards for evaluation and demonstration of features and capabilities of different MCU families.
- **Atmel Studio** provides a free Atmel IDE for development of C/C++ and assembler code for microcontrollers.
- **Atmel Data Visualizer** is a program used for processing and visualizing data. Data Visualizer can receive data from various sources such as, the Embedded debugger data gateway interface found on Xplained Pro boards and COM ports.
- **ATWILC3000-MR110CA Datasheet** details the ATWILC3000-MR110CA, which is a low-power consumption 802.11 b/g/n and Bluetooth 5.0 IoT (Internet of Things) module.
- **Microchip ATWILC Wireless Devices** provides resources for using Microchip's ATWILC wireless devices on Linux® Kernel.
- **SAMA5 ARM® Cortex® Based MPUs** page is an online directory to access the tools and software of SMART SAMA5 Cortex-A5-Based Embedded MPUs.
- **Advanced Software Framework (ASF)** contains example projects for ATWILC3000-MR110CA module.
- **MCP2221A USB 2.0 to I2C/UART** protocol converter with GPIO contains Driver package for DBG UART-USB converter.
- **ATWILC3000** is product page for ATWILC3000-MR110CA.

2. Hardware Specifications

2.1 Headers and Connectors

2.1.1 Standard SD/MMCplus Connector Pin Specification

The following table provides the pin descriptions for the standard MMCplus connector in SDIO and SPI Bus mode.

Table 2-1. Standard SD/MMCplus Connector Pin Details

SD Pin	MMCplus Pin	SDIO Bus Mode	SPI Bus Mode
1	1	DATA 3	SPI Card Select (Negative Logic)
2	2	CMD	SPI Serial Data In[MOSI]
3	3	VSS	VSS
4	4	VDD	VDD
5	5	SD CLK	SPI CLK
6	6	VSS	VSS
7	7	DATA 0	SPI Serial Data Out[MISO]
8	8	DATA 1	IRQN Interrupt
9	9	DATA 2	Unused
	10	DATA 4	Unused
	11	DATA 5	Unused
	12	DATA 6	Unused
	13	DATA 7	Unused

2.2 WILC3000 SD SD/MMCplus Connector

The WILC3000 SD has a PCB implemented SD card interface (J103) via the SD/MMCplus connector. This board supports only the SDIO interface; it does not support the MMCplus interface. The unused DATA 4, DATA5, DATA 6 pins of the MMCplus connector are connected to CHIP_EN, RESET_N, IRQ, which can be optionally used to configure the module in Sleep/Low-Power mode.

The following table provides the customized SD/MMCplus connector pin description for WILC3000 SD board.

Table 2-2. SD/MMCplus Connector Pin Description

Pin on SD/MMC Connector	Pin on ATWILC3000-MR110CA Module	Function	Description
1	27/25	SD DATA3/SPI CS	By default connected to SD DATA 3

Pin on SD/MMC Connector	Pin on ATWILC3000-MR110CA Module	Function	Description
2	23/26	SD CMD/SPI MOSI	By default connected to SD CMD
3	21	VSS	Ground
4	18/12	VDD	3.3V Power Supply
5	22/23	SD CLK, SPI CLK	By default connected to SD CLK
6	21	VSS	Ground
7	24	SD DATA0/SPI MISO	By default connected to SD DATA0
8	25/33	SD DATA1/IRQN	By default connected to SD DATA1
9	26	SD DATA2	SD DATA2
10	19	CHIP EN	WILC3000 Chip Enable
11	7	RESETN	WILC3000 Reset
12	33	IRQN	WILC3000 IRQ

2.3 Power Supply Selection

The WILC3000 SD can be powered either from the SD/MMCplus Connector or from USB power supply. Header J104 is used to choose between 3.3V supply from SD/MMCplus connector or 3.3V supply from DBG UART USB connector. Refer to the table below for more information.

Table 2-3. Power Supply Selection Pin Details

Pin No	Description
1	3.3V power supply from USB
2	VCC
3	3.3V power supply from SD/MMCplus

2.4 Current Measurement Header

Current measurement header (J105) can be used to measure the current consumed by the ATWILC3000-MR110CA module using an ammeter. J107 (not mounted) is provided to measure the current consumed by individual power rails, DVDDIO and V_{BAT}. Remove resistor R112 and connect an ammeter between pins 1 and 2 of J107 to measure DVDDIO current. Remove resistor R113 and connect an ammeter between pins 2 and 3 of J107 to measure V_{BAT} current.

2.5 Debug I2C Connector

I2C Slave interface is a two-wire serial interface consisting of a Serial Data Line (SDA) on module pin 10 and a serial clock line (SCL) on module pin 11. This interface is used for debugging of the ATWILC3000-MR110CA module on Debug I2C connector J102.

Table 2-4. Debug I2C Connector Pin Details

Pin No	Function	Description
1	DBG_SCL/I2C_SCL_M	By default connected to DBG_SCL. Cut Strap J111 and connect Strap J114 to use I2C_SCL_M
2	GND	Ground
3	DBG_SDA/I2C_SDA_M	By default connected to DBG_SDA. Cut Strap J112 and connect Strap J113 to use I2C_SCL_M
4	NC	Not Connected

2.6 DBG UART-USB Connector

The ATWILC3000-MR110CA module provides a 2 pin UART interface in module pins 16(TXD) and 17(RXD) which can be used for debugging. These pins are connected to MCP2221A, on-board USB to UART converter. The end user can use the USB Micro Type B Connector, J201 to connect to the test PC and view the debug logs from ATWILC3000-MR110CA module in Serial Terminal. Serial Terminal settings to be used are Baud rate: 115200, 8 bits, No Parity, 1 Stop Bit, No flow control.

2.7 Bluetooth UART Connector

Bluetooth subsystem is controlled through Bluetooth UART1, 4 pin interface for control and data transfer. Bluetooth UART1 is available in module pins 8 (TXD), 9 (RXD), 10 (RTS) and 11 (CTS) and connected to header J101. The RTS and CTS pins of Bluetooth UART1 are used for hardware flow control. These pins can be connected to the host MCU UART and could optionally be enabled from the firmware.

Table 2-5. Bluetooth UART Connector Pin Details

Pin No	Function	Description
1	GND	Ground.
2	BLE_UART_RTS	Bluetooth UART RTS. Optionally, hardware flow control is enabled.
3	VCC	3.3V power supply.
4	BLE_UART_RXD	Bluetooth UART RXD.
5	BLE_UART_TXD	Bluetooth UART TXD.
6	BLE_UART_CTS	Bluetooth UART CTS. Optionally, hardware flow control is enabled.

2.8 GPIO Connector

IRQN, CHIP EN, RESETN are connected to optional header “J106” for connecting to Host MCU if required. IRQN needs to be connected to the host board interrupt pin for RTOS-based example applications released in Microchip's Advanced Software Framework (ASF).

Table 2-6. GPIO Connector Pin Details

Pin No	Function	Description
1	IRQN	WILC3000 SD module Interrupt
2	CHIP EN	WILC3000 SD module Chip Enable
3	RESETN	WILC3000 SD module RESETN

3. SPI Interface Usage

The following section describes how to use the SPI interface via MMCplus/SD connector.

3.1 Using SPI Interface via MMCplus/SD Connector

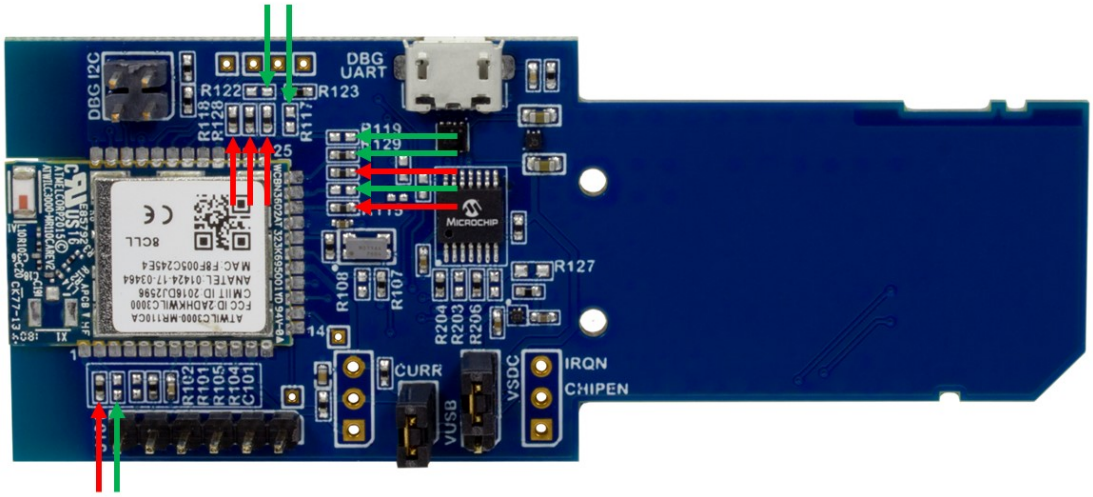
The following hardware rework must be done in the WILC3000 SD board to use the SPI interface rather than SDIO interface through the same MMCplus/SD connector.

To select the SPI interface:

1. Pull the pin 1 of wireless module (SDIO_CFG) high. To achieve this, remove R102 and mount R101 with a 1 MOhm pull-up resistor.
2. Remove R115 and R120 from the board and mount R116 with a 0 Ohm resistor for SPI_CLK. Replace 68 Ohm resistor mounted in R129 with a 0 Ohm resistor for SPI MISO.
3. Remove R118 and R121 from the board and mount R117 with a 0 Ohm resistor for SPI_SS.
4. Remove R120 and R128 from the board and mount R119 with a 0 Ohm resistor for SPI MOSI.

In figure below, the resistors marked in green arrows must be connected and those marked in red arrows must be removed.

Figure 3-1. Resistor Configuration for SPI Interface Selection



The table below summarizes the resistor configuration required:

Table 3-1. WILC3000 SD Resistor Configuration for SDIO/SPI

Peripheral Interface	Modification required in resistors
SDIO	Mounted Resistors: R118, R120, R115, R129, R128, R121, R102 Not mounted Resistors: R117, R119, R116, R122, R101

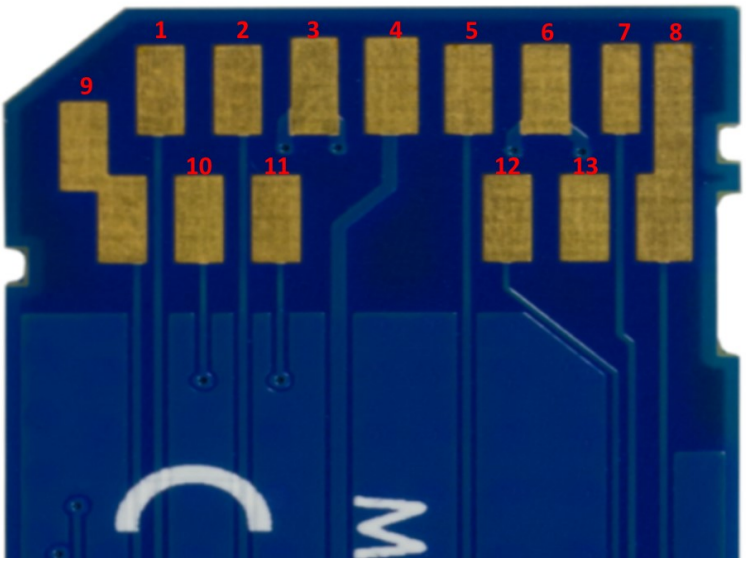
Peripheral Interface	Modification required in resistors
SPI	Mounted Resistors: R117, R119, R116, R129, R122, R101 Not mounted resistors: R118, R120, R115, R121, R102, R128

3.2 Using SPI Interface via Jumper Wires

The following hardware (jumper wires of equal length) rework must be done in the WILC3000 SD board to use the SPI interface using jumper wires:

1. Make the resistor modification explained in 3.1 Using SPI Interface via MMCplus/SD Connector to connect SPI to SD/MMCplus Connector.
2. Solder a jumper wire from pin 1 (refer the following figure) to the SPI_CS of host board.
3. Solder a jumper wire from pin 2 (refer the following figure) to the SPI_MOSI of host board.
4. Solder a jumper wire from pin 5 (refer the following figure) to the SPI CLK of host board.
5. Solder a jumper wire from pin 6 (refer the following figure) to Ground of host board.
6. Solder a jumper wire from pin 7 (refer the following figure) to the SPI_MISO of host board.
7. Use jumper wires to connect CHIP EN, RESETN from J106 to corresponding GPIOs/VCC of host board.
8. Use jumper wires to connect IRQN from J106 to host board interrupt pin.

Figure 3-2. Accessing SPI Interface using Jumper Wires



4. Regulatory Approval

WILC3000 SD Contains FCC ID: 2ADHKWILC3000

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 that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

5. Hardware Revision History and Known Issues

5.1 Identifying Product ID and Revision

The revision and product identifier of WILC3000 SD can be found by looking at the sticker on the bottom side of the PCB. The identifier and revision are printed in plain text as A09-nnnn\rr, where nnnn is the identifier and rr is the revision. In addition, the label contains a 10-digit serial number unique to each board.

The product identifier for WILC3000 SD is A09-2629.

5.2 Revision

The current revision is Revision 2 and there is no known issue in this revision.

6. Document Revision History

RevA - 09-2018

Section	Changes
Document	Initial release.

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