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## WINC1500 Xplained Pro User's Guide

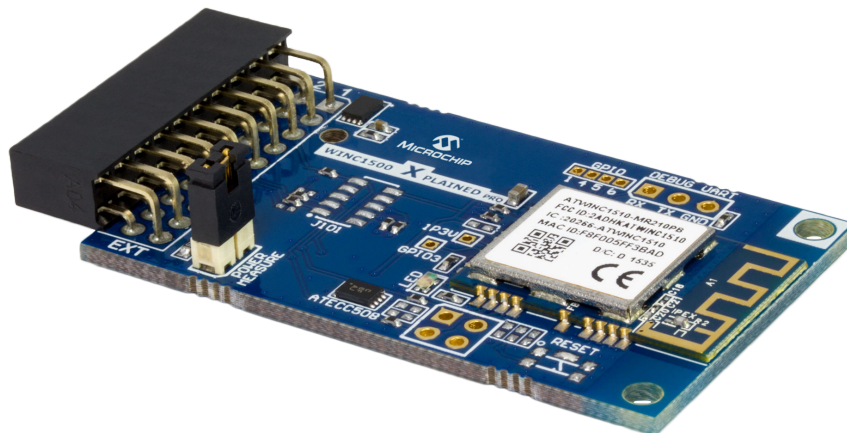
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### Description

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The WINC1500-XPRO is an extension board to evaluate the performance of the ATWINC15x0-MR210xB IoT (Internet of Things) module that supports an IEEE<sup>®</sup> 802.11 b/g/n standard. The WINC1500 Xplained Pro extension board is designed to provide Wi-Fi<sup>®</sup> functionality in the 2.4 GHz ISM band to the Xplained Pro evaluation platform. This kit provides access to the features of the ATWINC15x0-MR210xB wireless module and explains how to integrate the module in a custom design.

**Figure 1. WINC1500 Xplained Pro Extension Board**



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## 1. Introduction

### 1.1 Features

- Compliant Wi-Fi module with IEEE 802.11 b/g/n standard specifications:
  - Supports 20 MHz single spatial stream (1x1), up to 72.2 Mbps PHY rate in the 2.4 GHz ISM band
  - Supported network features: TCP, UDP, DHCP, ARP, HTTP, SSL, and DNS
  - Supports host interface through SPI
- Integrated Power Amplifier (PA), Tx/Rx switch and Printed Circuit Board (PCB) antenna
- Supports very low input level (sensitivity) and long range
- Supports on-chip network stack to offload MCU
- Integrated flash memory for system software
- Debug I<sup>2</sup>C and UART header footprints
- Extension port and RESET switch footprints
- Current measurement header
- Crypto authentication (optional)
- Xplained Pro extension hardware identification system
- Supports an operating temperature range from -40°C to +85°C
- Supports footprint compatible modules shown in the table below. The kit contains the ATWINC1510-MR210PB module by default

**Table 1-1. Wireless Modules**

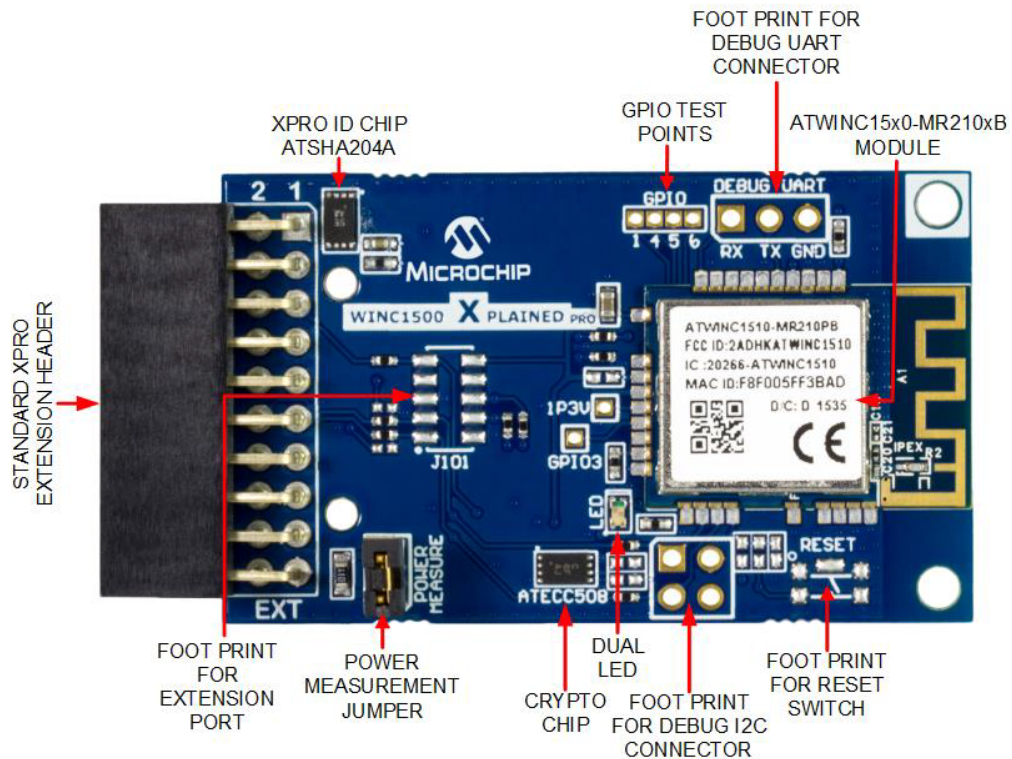
| Model Number       | No. of Pins | Description  | Regulatory Certification |
|--------------------|-------------|--|--------------------------|
| ATWINC1500-MR210PB | 28          | Certified Module with ATWINC1500B chip (4Mb Flash) and PCB printed antenna | FCC, IC, CE              |
| ATWINC1500-MR210UB | 28          | Certified Module with ATWINC1500B chip (4Mb Flash) and u.FL connector      | FCC, IC                  |
| ATWINC1510-MR210PB | 28          | Certified Module with ATWINC1510B chip (8Mb Flash) and PCB printed antenna | FCC, IC, CE              |
| ATWINC1510-MR210UB | 28          | Certified Module with ATWINC1510B chip (8Mb Flash) and u.FL connector      | Planned                  |

- Approved regulatory certification IDs for ATWINC1510-MR210PB:
  - United States/FCC ID: 2ADHKATWINC1510
  - Canada
    - IC ID: 20266-ATWINC1510
    - HVIN: ATWINC1510-MR210PB
  - Europe - CE

## 1.2 Kit Overview

The WINC1500-XPRO is an extension board for the SmartConnect-ATWINC15x0-MR210xB Wi-Fi module for the Xplained Pro platform. It connects to any Xplained Pro standard extension header on any Xplained Pro MCU board to provide Wi-Fi functionality.

**Figure 1-1. WINC1500-XPRO Overview**



## 2. Getting Started

The WINC1500-XPRO is designed to connect with an Xplained Pro extension header marked as EXT1. However, it is compatible with all Xplained Pro EXT headers. Refer to the pin description of the Xplained Pro evaluation kit to find out the suitable EXT headers of the Xplained Pro.

### 2.1 Xplained Pro Quick Start

Steps to start exploring the Xplained Pro platform:

1. Download and install [Atmel Studio](#).
2. Launch Atmel Studio.

The operating system installs the driver software automatically the first time the Xplained Pro evaluation kit is connected to a PC. This driver supports 32-bit and 64-bit versions of Microsoft® Windows® XP, Windows Vista®, Windows 7, Windows 8, Windows 10, and Windows Server 2012.

When the Xplained Pro MCU board is powered, the power LED (green) glows and Atmel Studio automatically detects the specific Xplained Pro MCU and extension board(s) that are connected. The kit landing page in Atmel Studio comes with an option to launch Atmel Software Framework (ASF) and Atmel START example application codes for the kit. The target device is programmed and debugged by the on-board Embedded Debugger and therefore no external programmer or debugger tool is required.

### 2.2 Design Documentation and Relevant Links

The following list contains the link to the relevant documents and software for the WINC1500-XPRO:

- [WINC1500-XPRO](#) - Product page
- [WINC1500-XPRO Design Documentation](#) - Package containing schematics, BOM, assembly drawings, 3D plots, layer plots, etc.
- [ATWINC15x0-MR210xB](#) - Wireless module datasheet
- [WINC1500](#) - Wireless chip datasheet
- [ATECC508A-MAHDA-T](#) - Crypto Authentication Device datasheet
- [ATWINC1500B Hardware Design Guidelines - IEEE 802.11 b/g/n IoT Module](#) - Hardware Design Guide
- [Getting Started Guide for ATWINC1500 Wi-Fi using SAM D21 Xplained Pro](#) - User Guide
- [Software Programming Guide for ATWINC1500 Wi-Fi using SAM D21 Xplained Pro](#) - Programming Guide
- [ATWINC1500 Wi-Fi Network Controller - Software Design Guide](#) - Design Guide
- [ATWINC1500 AT Command Reference Guide](#) - Command Reference Guide
- [ATWINC1500 Wi-Fi Network Controller - AP Provision Mode](#) - Application Note
- [ATWINC1500 Wi-Fi Network Controller - Station Mode](#) - Application Note
- [ATWINC1500 Wi-Fi Network Controller - P2P Mode](#) - Application Note
- [ATWINC1500 Wi-Fi Network Controller - HTTP Provision Mode](#) - Application Note
- [TCP Client and Server Operation using ATWINC1500](#) - Application Note
- [ATWINC1500 Weather Client Example](#) - Application Note
- [Xplained Pro products](#) - The Xplained Pro 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](#) - Atmel Studio provides a free Atmel IDE for development of C/C++ and assembler code for microcontrollers, and relevant documentation
- [Atmel Data Visualizer](#) - 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
- [EDBG User Guide](#) - User guide containing more information about the on-board Embedded Debugger

### 3. Xplained Pro

Xplained Pro is an evaluation platform which contains a series of microcontroller boards (evaluation kits) and extension boards. Atmel Studio is used to program and debug the microcontrollers on these boards. Atmel Studio includes ASF and Atmel START, which has drivers and demo code, and Data Visualizer, which supports data streaming and advanced debugging. Xplained Pro evaluation kits can be connected to a wide range of Xplained Pro extension boards through standardized headers and connectors. Xplained Pro extension boards have identification (ID) chips to uniquely identify which boards are connected to the Xplained Pro evaluation kits.

#### 3.1 Hardware Identification System

All Xplained Pro extension boards come with an identification chip (ATSHA204A CryptoAuthentication chip) to uniquely identify the boards that are connected to the Xplained Pro evaluation kit. This chip contains information that identifies the extension with its name and some extra data. When an Xplained Pro extension is connected to an Xplained Pro evaluation kit, the information is read and sent to Atmel Studio. The following table shows the data fields stored in the ID chip with example content.

**Table 3-1. Xplained Pro ID Chip Content**

| Data Field            | Data Type    | Example Content              |
|-----------------------|--------------|------------------------------|
| Manufacturer          | ASCII string | Atmel\0'                     |
| Product Name          | ASCII string | Segment LCD1 Xplained Pro\0' |
| Product Revision      | ASCII string | 02\0'                        |
| Product Serial Number | ASCII string | 1774020200000010\0'          |
| Minimum Voltage [mV]  | uint16_t     | 3000                         |
| Maximum Voltage [mV]  | uint16_t     | 3600                         |
| Maximum Current [mA]  | uint16_t     | 30                           |

#### 3.2 Xplained Pro Standard Extension Header

All Xplained Pro kits have one or more dual row, 20-pin, 100-mil extension header. The Xplained Pro MCU boards have male headers, while the Xplained Pro extensions have their female counterparts. All connected pins follow the defined pin description in the table.



**Info:** All pins are not always connected on all extension headers.

The extension headers can be used to connect a variety of Xplained Pro extensions to Xplained Pro MCU boards or to access the pins of the target microcontroller on Xplained Pro MCU boards directly.

**Table 3-2. Xplained Pro Standard Extension Header**

| Pin Number | Pin Name             | Description   |
|------------|----------------------|---|
| 1          | ID                   | Pin to communicate with the ID chip on an extension board   |
| 2          | GND                  | Ground  |
| 3          | ADC(+)               | Analog-to-Digital Converter; alternatively, a pin for the positive terminal of a differential ADC |
| 4          | ADC(-)               | Analog-to-Digital Converter; alternatively, a pin for the negative terminal of a differential ADC |
| 5          | GPIO1                | General purpose I/O pin   |
| 6          | GPIO2                | General purpose I/O pin   |
| 7          | PWM(+)               | Pulse width modulation; alternatively, a pin for the positive part of a differential PWM          |
| 8          | PWM(-)               | Pulse width modulation; alternatively, a pin for the negative part of a differential PWM          |
| 9          | IRQ/GPIO             | Interrupt request pin and/or general purpose I/O pin  |
| 10         | SPI_SS_B/<br>GPIO    | Slave select pin for Serial Peripheral Interface (SPI) and/or general purpose I/O pin             |
| 11         | I <sup>2</sup> C_SDA | Data pin for I <sup>2</sup> C interface. Always connected, bus type                               |
| 12         | I <sup>2</sup> C_SCL | Clock pin for I <sup>2</sup> C interface. Always connected, bus type                              |
| 13         | UART_RX              | Receiver pin of target device UART  |
| 14         | UART_TX              | Transmitter pin of target device UART   |
| 15         | SPI_SS_A             | Slave select for SPI. This pin should preferably not be connected to anything else.               |
| 16         | SPI_MOSI             | SPI master out slave in pin. Always connected, bus type   |
| 17         | SPI_MISO             | SPI master in slave out pin. Always connected, bus type   |
| 18         | SPI_SCK              | SPI clock pin. Always connected, bus type   |
| 19         | GND                  | Ground pin for extension boards   |
| 20         | VCC                  | Power pin for extension boards  |



## 4. Hardware Specifications

### 4.1 Headers and Connectors

#### 4.1.1 WINC1500-XPRO Extension Header

The WINC1500-XPRO implements one Xplained Pro Standard Extension Header marked with EXT in the PCB silkscreen. This header makes it possible to connect the board to any Xplained Pro MCU board. The following table provides pin descriptions for the extension header. Among the interfaces of wireless module, SPI is the only host interface; UART is for debug and I<sup>2</sup>C is for development debug. UART and I<sup>2</sup>C signals are accessed through debug connectors J103 and J104 respectively. So, UART\_RXD and UART\_TXD connections of wireless module with host can be separated by removing R117 and R118 to access them only at J103. To find the location of these resistors on board refer to [WINC1500-XPRO Design Documentation in page 5](#). Similarly, I2C\_SDA and I2C\_SCL connections of the wireless module with the host can be separated by removing R107 and R108 respectively; I<sup>2</sup>C connection in J100 can be used to the control crypto device by the host.

**Table 4-1. WINC1500-XPRO Extension Header**

| Pin Number | Pin Name | Description  |
|------------|----------|--|
| 1          | ID_DATA  | Communication line to ID chip  |
| 2          | GND      | Ground   |
| 3          | NC       | -  |
| 4          | NC       | -  |
| 5          | RESET_N  | Active-low hard reset to the board   |
| 6          | WAKE     | Active-high host wake control signal to the wireless module                      |
| 7          | NC       | -  |
| 8          | NC       | -  |
| 9          | IRQN     | Interrupt output from the wireless module to the host                            |
| 10         | CHIP_EN  | Active-high module enable signal to wireless module from host                    |
| 11         | I2C_SDA  | Data line for I <sup>2</sup> C interface   |
| 12         | I2C_SCL  | Clock line for I <sup>2</sup> C interface  |
| 13         | UART_RX  | Receive pin of target MCU UART interface   |
| 14         | UART_TX  | Transmit pin of target MCU UART interface  |
| 15         | SPI_SSN  | Active-low Slave select signal of the SPI interface to wireless module from host |
| 16         | SPI_MOSI | Master out, Slave in signal of target MCU SPI interface                          |
| 17         | SPI_MISO | Master in, Slave out signal of target MCU SPI interface                          |
| 18         | SPI_SCK  | Clock line of the SPI interface  |

| Pin Number | Pin Name   | Description   |
|------------|------------|---|
| 19         | GND        | Ground  |
| 20         | VCC_TARGET | Target +3.3V supply voltage from the host MCU board |

#### 4.1.1.1 Power Measurement Header

The current measurement header (J102) can be used to measure the total current consumed by the ATWINC15x0-MR210xB module using a voltmeter. To measure the total current consumption of the module, remove the jumper from J102 and connect a voltmeter across its pins. A 1Ω resistor available on-board across the jumper gives a 1:1 relationship between voltage drop and current consumption.

#### 4.1.1.2 Debug Connectors

The Debug UART Header (J103) is not mounted on the board. The following table provides connector and module pin descriptions. This connector should be mounted for debug using this UART. A USB Hi-Speed to UART Cable like **FTDI** is needed to connect J103 with PC to print debug log. The following settings are recommended for making serial port setup for debug UART communication. To find the latest settings for serial port setup refer to [Getting Started Guide for ATWINC1500 Wi-Fi using SAM D21 Xplained Pro in page 5](#)

- Baud rate : 115200
- Data : 8 bit
- Parity : none
- Stop : 1 bit
- Flow control : none

**Table 4-2. Debug UART Connector J103**

| Pin on UART Connector | Pin on ATWINC15x0-MR210xB module | Function |
|-----------------------|----------------------------------|----------|
| 1                     | 19                               | UART RX  |
| 2                     | 14                               | UART TX  |
| 3                     | 28                               | Ground   |

The Debug I<sup>2</sup>C Header (J104) is not mounted on the board. The following table provides connector and module pin descriptions. This I<sup>2</sup>C connector should be mounted only for development debug. An I2C/SPI Host Adapter like **Aardvark** is needed to connect J104 with PC.

**Table 4-3. Debug I<sup>2</sup>C Connector J104**

| Pin on I <sup>2</sup> C connector | Pin on ATWINC15x0-MR210xB module | Function             |
|-----------------------------------|----------------------------------|----------------------|
| 1                                 | 2                                | I <sup>2</sup> C SCL |
| 2                                 | 28                               | Ground               |
| 3                                 | 3                                | I <sup>2</sup> C SDA |
| 4                                 | -                                | Not Connected        |

The I<sup>2</sup>C and UART pins of the wireless module are also connected with Extension port receptacle J101. The connector can be used for connecting an extension board or for debugging purposes. It is currently not mounted on the board.

**Table 4-4. Extension Port / Debug Connector J101**

| Pin on Extension Port | Pin on ATWINC15x0-MR210xB module | Function             |
|-----------------------|----------------------------------|----------------------|
| 1                     | 3                                | I <sup>2</sup> C_SDA |
| 2                     | -                                | NC                   |
| 3                     | 2                                | I <sup>2</sup> C_SCL |
| 4                     | 19                               | UART_RXD             |
| 5                     | 28                               | GND                  |
| 6                     | 14                               | UART_TXD             |
| 7                     | -                                | NC                   |
| 8                     | 28                               | GND                  |
| 9                     | 4                                | RESET_N              |
| 10                    | 23 and 20                        | VCC_MODULE (+3.3V)   |

## 4.2 WINC1500-XPRO Peripherals

### 4.2.1 ATWINC15x0-MR210xB Control Signals

The ATWINC15x0-MR210xB main control pins are connected to the Xplained Pro extension header. SPI is the only host interface.

**Table 4-5. ATWINC15x0-MR210xB Control Signals**

| Pin on Extension Header | Pin on ATWINC15x0-MR210xB module | Function |
|-------------------------|----------------------------------|----------|
| 5                       | 4                                | RESET_N  |
| 6                       | 11                               | WAKE     |
| 9                       | 13                               | IRQ_N    |
| 10                      | 22                               | CHIP_EN  |
| 15                      | 16                               | SPI_SSN  |
| 16                      | 15                               | SPI_MOSI |
| 17                      | 17                               | SPI_MISO |
| 18                      | 18                               | SPI_SCK  |

### 4.2.2 LED

There is one dual green/red LED on the Xplained Pro extension board that is controlled by the ATWINC15x0-MR210xB. These LEDs are used to show application status.

**Table 4-6. LED Connection**

| Pin on ATWINC15x0-MR210xB module | Function           |
|----------------------------------|--------------------|
| 27                               | GPIO 5 (Green LED) |
| 1                                | GPIO 6 (Red LED)   |

### 4.2.3 Crypto Device

The WINC1500-XPRO features a CryptoAuthentication™ device (ATECC508A). The same I<sup>2</sup>C interface lines are shared between the two slave devices (WINC1500 module and crypto device). Host MCU from the Xplained Pro MCU board will be the Master for this I<sup>2</sup>C. I<sup>2</sup>C connections of the wireless module with the host can be separated by removing R107 and R108 for communication between crypto device and MCU. If there is any issue in this communication, Pull-up resistors R104 and R105 should be mounted.

**Table 4-7. Crypto Device Connection**

| Pin on ATWINC15x0-MR210xB module | Function  |
|----------------------------------|-----------|
| 3                                | I2C data  |
| 2                                | I2C clock |

## 4.3 Hardware Revision History

### 4.3.1 Identifying Product ID and Revision

The revision and product identifier of the WINC1500-XPRO 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. The label also contains a 10 digit serial number unique to each board.

The product identifier for the WINC1500-XPRO is A09-2442.

### 4.3.2 Revision

Revision 6 of the WINC1500 Xplained Pro is the initial released version. Revision 12 of the WINC1500 Xplained Pro is the latest released version.

## 5. Ordering Information

Following table describes the ordering details of the ATWINC1500-XPRO evaluation boards.

**Table 5-1. Ordering Details**

| Model Number  | Ordering Code   | Kit Description                       | Package Contents  |
|---------------|-----------------|---------------------------------------|---|
| WINC1500-XPRO | ATWINC1500-XPRO | ATWINC1500 Xplained Pro extension kit | ATWINC1500 Xplained Pro Extension board   |
| WINC1500-XSTK | ATWINC1500-XSTK | ATWINC1500 Xplained Pro starter kit   | SAMD21 Xplained Pro, WINC1500 Xplained Pro Extension board, I/O1 Xplained Pro Extension board and Two USB Type A to Micro B Cables (1.5m) |

## 6. Document Revision History

### Revision A (May 2017)

- Initial release of this document using the Microchip format.

### Previously Released Atmel Revisions

| Doc. rev. | Date       | Comment                              |
|-----------|------------|--------------------------------------|
| 42388B    | 17/11/2015 | Wireless module part number updated. |
| 42388A    | 15/04/2015 | Initial document release.            |

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