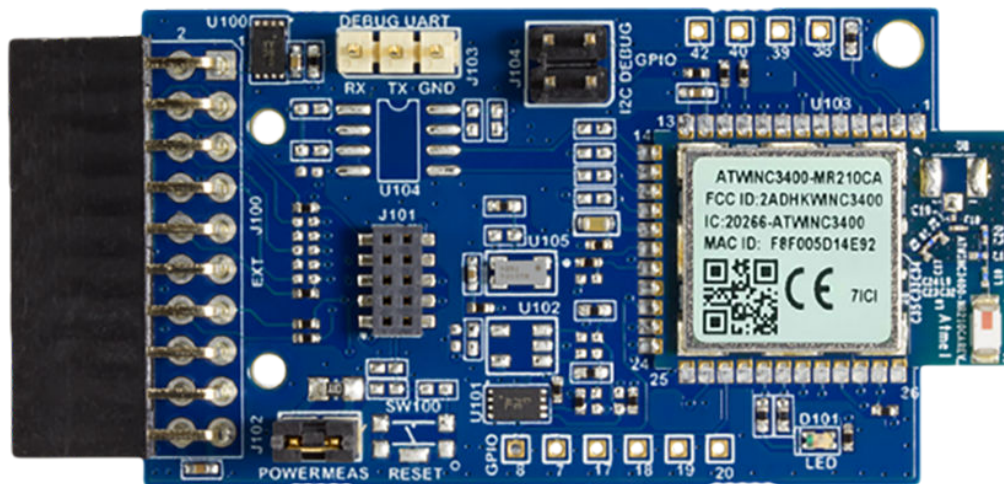# ATWINC3400-XPRO

## ATWINC3400 Wi-Fi® Network Controller Xplained Pro User Guide

## Introduction

The ATWINC3400-XPRO is an extension board to evaluate the performance of the ATWINC3400-MR210CA, an IEEE® 802.11 b/g/n RF/Baseband/MAC Network Controller with Integrated Low Energy Bluetooth® 4.0 compliant module. The ATWINC3400 Xplained Pro extension is designed to provide Wi-Fi® and Bluetooth functionality in 2.4 GHz ISM band to the Xplained Pro evaluation platform. This kit provides easy access to the features of the ATWINC3400-MR210CA and explains how to integrate the device in a custom design.



## Features

- The **ATWINC3400-MR210CA**: IEEE 802.11 b/g/n Link Controller with Integrated Low Energy Bluetooth 4.0 compliant module features the following:
  – IEEE 802.11 b/g/n 20MHz (1x1) Wi-Fi solution
    • Single spatial stream, up to 72 Mbps PHY rate in 2.4 GHz ISM band
    • Network features: Firmware version 1.2.x, TCP, UDP, DHCP, ARP, HTTP, SSL, DNS, and SNTP
    • Host interface through SPI
  – Bluetooth Low Energy (BLE) 4.0
    • Adaptive Frequency Hopping
    • Host Control Interface (HCI) through high speed UART

- – Integrated PA, T/R switch and chip antenna
  - – Superior sensitivity and range
  - – On-Chip Network Stack to offload MCU
  - – Integrated flash memory for system software
  - – I$^2$C and UART host interfaces
  - – Operating temperature range of -40 to +85°C
- Debug I$^2$C and UART headers
- Current Measurement header
- Optional SPI flash boot
- ATECC508A Crypto Authentication Device
  - – Ideal for IoT node security
  - – Secure hardware-based Key Storage
  - – Internal High-quality FIPS Random Number Generator
- Xplained Pro extension hardware identification system

# Table of Contents

# 1.    Kit Overview

The ATWINC3400-XPRO is a carrier board for the SmartConnect-ATWINC3400-MR210CA Wi-Fi/BLE 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/BLE functionality.

**Figure 1-1.  ATWINC3400-XPRO**
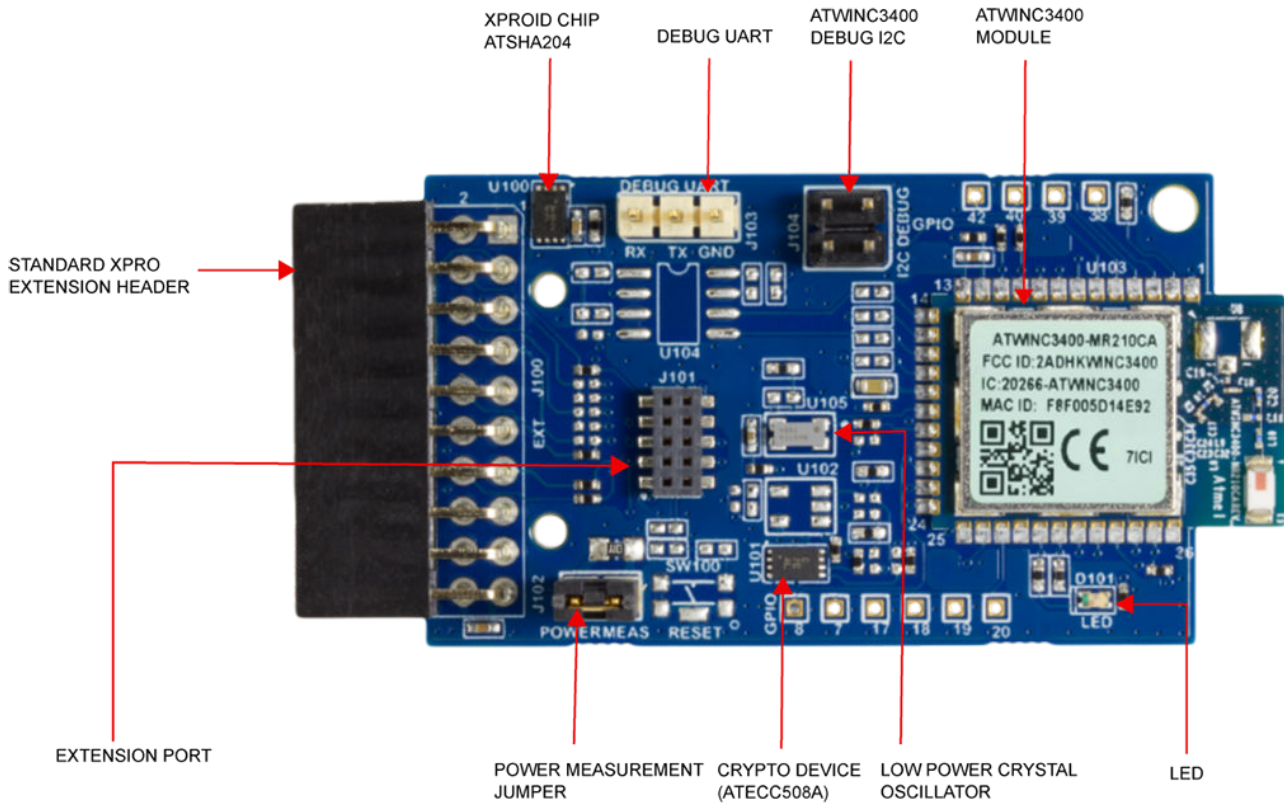
## 2.      Getting Started

The ATWINC3400-XPRO has been designed to be connected to an Xplained Pro extension header marked as EXT1. However, it is compatible with all Xplained Pro extension headers. Refer to the pin-out of your Xplained Pro evaluation kit to find out which Xplained Pro extension headers can be used.

### 2.1      Xplained Pro Quick Start

Steps to start exploring the Xplained Pro platform:

1.  Download and install Atmel Studio.
2.  Launch Atmel Studio.

When the Xplained Pro MCU kit is connected to the computer for the first time, the operating system installs the driver software automatically. 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 the Atmel Studio automatically detects the specific Xplained Pro MCU and extension board(s) that are connected. The landing page of the kit in the Atmel Studio has an option to launch the Atmel Software Framework (ASF) and the 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 links to the most relevant documents and software for ATWINC3400-XPRO:

- **Xplained Pro products** - Atmel Xplained Pro is a series of small-sized and easy-to-use evaluation kits for Atmel microcontrollers and other Atmel products. It consists of a series of low-cost MCU boards for evaluation and demonstration of features and capabilities of different MCU families.
- **ATWINC3400-XPRO User Guide**- Product documents page.
- **ATWINC3400-XPRO Design Documentation**- Package containing schematics, BOM, assembly drawings, 3D plots, layer plots, etc.
- **Atmel Studio**- Free Atmel IDE for development of C/C++ and assembler code for Atmel microcontrollers.
- **EDBG User Guide**- User guide containing more information about the on board Embedded Debugger.
- **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.
- **ATWINC3400-XPRO**- Product page.
- **ATWINC3400-MR210CA**- Wireless module datasheet.
- **ATWINC3400**- Wireless chip datasheet.
- **ATWINC3400 BLE Provisioning – Setup and Usage**- Application Note.
- **ATECC508A-MAHDA-T**- Crypto Authentication Device datasheet.
- **AT24MAC602-STUM-T**- Serial EEPROM datasheet.

## 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 the 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 | Microchip'\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 many dual row, 20-pin, 100-mil extension headers. The Xplained Pro MCU boards have male headers, while the Xplained Pro extensions have their female counterparts. The following table provides the pin description of all the connected pins.

**Info:**   Not all pins are 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 the Xplained Pro boards.

**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/ GPIO | Slave select pin for Serial Peripheral Interface (SPI) and/or general purpose I/O pin. |
| 11 | $I^2C\_SDA$ | Data pin for $I^2C$ interface. Always connected, bus type. |
| 12 | $I^2C\_SCL$ | Clock pin for $I^2C$ 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 Users Guide

## 4.1 Headers and Connectors

### 4.1.1 ATWINC3400-XPRO Extension Header

The ATWINC3400-XPRO implements one Xplained Pro Standard Extension Header marked with EXT in PCB silkscreen. This header makes it possible to connect the board to any Xplained Pro MCU board. The pin-out definition for the extension header can be seen below.

**Table 4-1. ATWINC3400-XPRO Extension Connector**

| Pin on EXT | Function | Description |
| --- | --- | --- |
| 1 | ID_DATA | Communication line to ID chip |
| 2 | GND | Ground |
| 3 | HOST_WAKEUP | Wakeup signal to the host from wireless module |
| 4 | RESET_N | Reset signal from Xpro's host MCU |
| 5 | UART_RTS | Request To Send (RTS) for 4-pin UART interface flow control/handshaking |
| 6 | UART_CTS | Clear To Send (CTS) for 4-pin UART interface flow control/handshaking |
| 7 | CHIP_EN | Secondary optional Chip enable signal for wireless module from host MCU of an XPRO in which pin 10 of EXT header can't be used for chip enable. |
| 8 | RTC_MCU | Real-time clock from Host MCU. It is secondary clock source. Primary clock is from on-board RTC oscillator. |
| 9 | IRQN | Interrupt request to host |
| 10 | CHIP_EN | Primary chip enable signal for wireless module from host MCU |
| 11 | I2C_SDA_S | Data line for slave I$^2$C interface to ECC508 |
| 12 | I2C_SCL_S | Clock line for slave I$^2$C interface to ECC508 |
| 13 | BT_UART1_TXD | Transmit pin of wireless module's UART interface |
| 14 | BT_UART1_RXD | Receive pin of wireless module's UART interface |
| 15 | SPI_SSN_WiFi | Slave select/Chip select signal of slave SPI interface for Wi-Fi |
| 16 | SPI_MOSI_WiFi | Master out-Slave in signal of slave SPI interface for Wi-Fi |
| 17 | SPI_MISO_WiFi | Master in-Slave out signal of slave SPI interface for Wi-Fi |
| 18 | SPI_SCK_WiFi | Clock line of slave SPI interface for Wi-Fi |

| Pin on EXT | Function | Description |
|---|---|---|
| 19 | GND | Ground |
| 20 | VCC_TARGET | Target +3.3V supply voltage from host MCU board |

### 4.1.2 Power Measurement Header

Current measurement header (J102) can be used to measure the total current consumed by the ATWINC3400-MR210CA 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.

There are two 0Ω resistors, R135 and R136, that can be removed one by one to connect the ammeter across the corresponding resistor pads to measure the current consumed by individual power rails of the ATWINC3400-MR210CA, VBAT and VDDIO respectively.

### 4.1.3 Debug Connectors

Debug I$^2$C Header (J104) is mounted on the board. The connector and module pinouts are given below. This I$^2$C connector is only for development debug. An I$^2$C/SPI Host Adapter like **Aardvark** is required to connect J104 with PC GUI to program and debug.

**Table 4-2. Debug I$^2$C Connector J104**

| Pin on I$^2$C connector | Pin on ATWINC3400-MR210CA module | Function |
|---|---|---|
| 1 | 11 | I$^2$C SCL |
| 2 | 1 | Ground |
| 3 | 10 | I$^2$C SDA |
| 4 | - | Not Connected |

Debug UART Header (J103) is mounted on the board. This connector is for debug using this UART. A USB high speed to UART Cable like **FTDI** is required to connect J103 with PC to print debug log. The connector and module pinouts are given below.

**Note:** Remove R143 and R144 resistors for enabling the debug I2C Interface.

**Table 4-3. Debug UART Connector J103**

| Pin on UART Connector | Pin on ATWINC3400-MR210CA module | Function |
|---|---|---|
| 1 | 17 | WiFi_UART_RXD |
| 2 | 16 | WiFi_UART_TXD |
| 3 | 1 | Ground |

I$^2$C and UART pins of wireless module are connected with Extension port receptacle J101. The connector can be used for connecting extension board or Debug purpose.

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

| Pin on Extension Port | Pin on ATWINC3400-MR210CA module | Function |
|---|---|---|
| 1 | 10 | I2C_SDA_S |
| 2 | - | NC |
| 3 | 11 | I2C_SCL_S |
| 4 | 9 | BT_UART_RXD |
| 5 | 1 | GND |
| 6 | 8 | BT_UART_TXD |
| 7 | - | NC |
| 8 | 1 | GND |
| 9 | 7 | RESET_N |
| 10 | 12 and 18 | VCC_MODULE (+3.3V) |

## 4.2    ATWINC3400-XPRO Peripherals

### 4.2.1    Serial Flash

The ATWINC3400-XPRO features an external SPI Flash. Master SPI interface of the ATWINC3400 is used for communication with Flash. Provision to assemble Flash on PCB is given; however, the device is not mounted on the board (Part number- AT25DF081A-SSH-T, Reference number - U104).

**Table 4-5.  Serial Flash Connections**

| Pin on ATWINC3400-MR210CA module | Function |
|---|---|
| 14 | SPI SCK |
| 16 | SPI MOSI |
| 17 | SPI MISO |
| 15 | SPI SS |

### 4.2.2    LED

There is a dual green/red LED on the ATWINC3400-XPRO extension board that is controlled by the ATWINC3400-MR210CA. These LEDs are used to show the application status.

**Table 4-6.  LED Connection**

| Pin on ATWINC3400-MR210CA module | Function |
|---|---|
| 29 | Green LED |
| 30 | Red LED |

### 4.2.3    Crypto Device

The ATWINC3400-XPRO features an ATECC508A CryptoAuthentication device. The device is mounted on the board (Part number- ATEC508A-MAHDA-T, Reference number - U101). The primary connection of

the device with the host MCU is through an I2C interface available at 20 pin header . Master I$^2$C interface of the ATWINC3400 has been provided as optional secondary I2C communication interface with the crypto device.

**Table 4-7. ATECC508A Connections**

| Pin on ATWINC3400-MR210CA module | Function |
| --- | --- |
| 35 | I$^2$C data |
| 34 | I$^2$C clock |

### 4.2.4 EEPROM

The ATWINC3400-XPRO features an external EEPROM. Master I$^2$C interface of the ATWINC3400 is used for communication with EEPROM. Provision to assemble EEPROM is given; however, the device is not mounted in board (Part number- AT24MAC602-STUM-T, Reference number - U102) .

**Table 4-8. EEPROM Connections**

| Pin on ATWINC3400-MR210CA module | Function |
| --- | --- |
| 35 | I$^2$C data |
| 34 | I$^2$C clock |

### 4.2.5 Test Points

Some test points are available for use on the board. TP101 and TP103 can be used in addition with SPI interface lines for SDIO interface which needs some hardware rework. TP103, TP104, TP105, and TP106 can be used for PCM interface by appropriately disconnecting the multiplexed alternate functionality. TP107, TP108, TP109, and TP110 pins are GPIO38, 39, 40, and 42 pins of the ATWINC3400 chip respectively.

**Table 4-9. Test Point Connections**

| Test Point | Pin on ATWINC3400-MR210CA module | Function |
| --- | --- | --- |
| TP101 | 22 | GPIO8; Pin multiplexed with optional BT_UART1_CTS2 |
| TP102 | 27 | GPIO7; Pin multiplexed with optional BT_UART1_RTS2 |
| TP103 | 29 | GPIO17; Pin multiplexed with dual LED D101 (Green) |
| TP104 | 30 | GPIO18; Pin multiplexed with dual LED D101 (Red) |
| TP105 | 31 | GPIO19 |
| TP106 | 32 | GPIO20 |

## 5.      Hardware Revision History and Known Issues

### 5.1      Identifying Product ID and Revision

The revision and product identifier of the ATWINC3400-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 ATWINC3400-XPRO is A09-2623.

### 5.2      Revision

Revision 5 was the initially released revision. Revision 6 is the latest revision, and there are no known issues.

# 6.   Document Revision History

**Rev A - 11/2017**

| Section | Changes |
|---------|---------|
| Document | • Updated from Atmel to Microchip template.<br>• Previous version is Atmel 42690 revision A. |

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