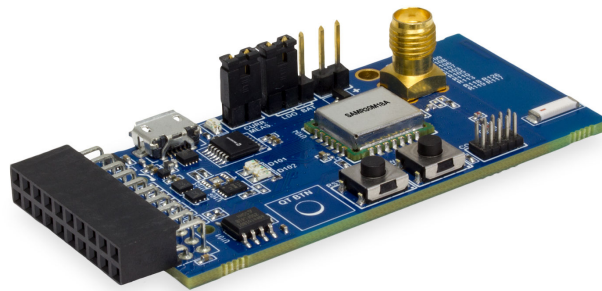

SAMR30 Module Xplained Pro User's Guide

Introduction

The SAMR30 Module Xplained Pro (XPro) evaluation kit is a hardware platform to evaluate the performance of ATSAMR30M18A which is a Sub-1 GHz IEEE[®] 802.15.4[™] compliant RF module. This evaluation kit is supported by the Atmel Studio Integrated Development Platform (IDP), which provides easy access to various ready-to-use applications supported by the Microchip ATSAMR30M18A module. This user's guide facilitates how to get started with the SAMR30 extension board and how to integrate the module in a custom design. The extension board is designed to provide 802.15.4 wireless functionality to the Xplained Pro evaluation platform in 700/800/900 MHz industrial, scientific and medical (ISM) band.



Features

- ATSAMR30M18A module is an IEEE 802.15.4 compliant wireless module for 700/800/900 MHz⁽¹⁾⁽⁴⁾ applications
 - ATSAMR30E18A (ARM[®] Cortex[®] -M0+) System-in-a-Package (SiP)
 - Single-ended RF output through the PCB castellated pad
 - Radio module with a link budget
 - RX sensitivity up to -105⁽²⁾⁽⁴⁾ dBm
 - TX output power up to 8.7⁽²⁾⁽⁴⁾ dBm
 - High precision 16 MHz crystal oscillator
- On-board chip antenna for quick evaluation and an SMA connector for conducted measurements and external antenna⁽³⁾
- On-board MCP2221A USB-UART/I²C convertor for observing console logs from the SAMR30
- On-board AT30TSE758A Digital Temperature Sensor
 - Integrated temperature sensor, non-volatile registers, and serial EEPROM
 - Two wire I²C and SMBus compatible serial interface
- On-board 4 Mb SPI Flash
- Footprint provision for evaluating CryptoAuthentication[™] device ATECC608A/ATECC508A

- Power supply options
 - USB (Default option selected by on-board power multiplexer)
 - Host XPro through extension header
 - Battery header
- Standalone operation with power supplied through USB header
- Current measurement header
- Debug SWD header
- Digital I/O
 - Xplained Pro extension header comprising SPI, I²C, and UART interfaces of the ATSAMR30M18A
 - One RESET button and one user button
 - Two user LEDs
 - One LED for power indication
 - One QTouch[®] button
- Supports Performance Analyzer example application in Atmel Studio
- Operating temperature range is from -40°C to +85°C
- Xplained Pro hardware identification system

Note:

1. The chip antenna supports only the 858-928 MHz band. The rest of the frequency bands supported by the ATSAMR30M18A module can be evaluated through the on-board SMA connector.
2. When $f_{RF}=868.3$ MHz, BPSK-20.
3. By default, the chip antenna is connected to the RF output of the module. The SMA connector (J106) can be connected to the RF trace by removing L106 and mounting R115. For the schematic, refer to SAMR30 Module XPRO design documentation on the Microchip website: <https://www.microchip.com/DevelopmentTools/ProductDetails/AC164159>
4. The SMA connector is intended to be used only for laboratory evaluation purposes. For field usage in USA/Canada, the antenna port must be of type RP(Reverse Polarity)-SMA.

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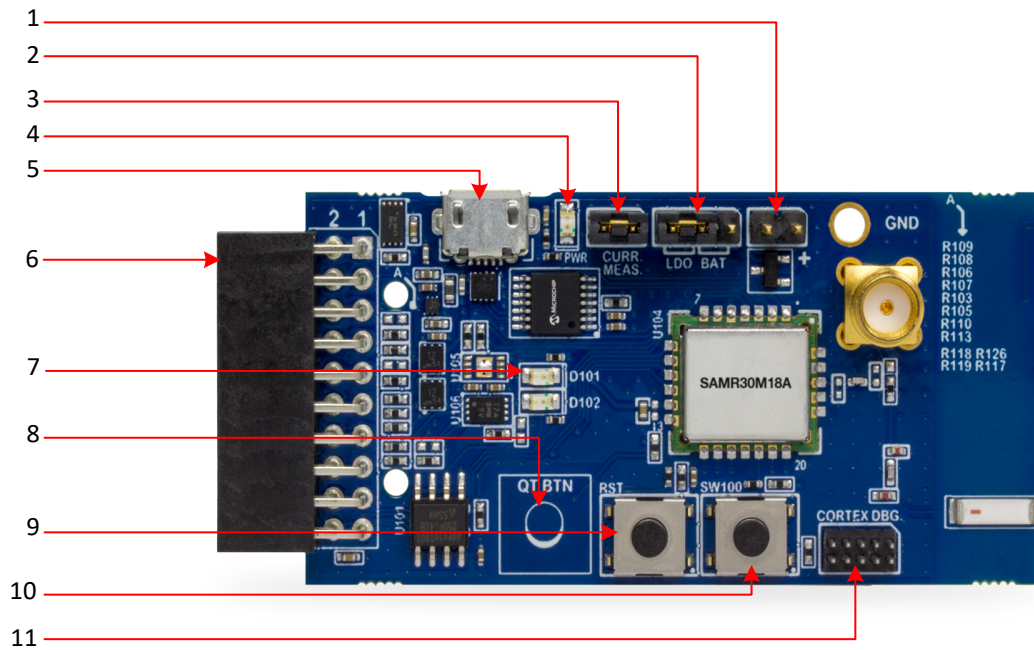
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1. Kit Overview

The SAMR30 module XPro is a carrier board for evaluation of the ATSAMR30M18A module in Xplained Pro evaluation platform. This evaluation kit can be operated in the standalone mode by powering the board through the USB header, or can be connected with any Xplained Pro standard extension header on any Xplained Pro MCU board to evaluate IEEE 802.15.4 wireless functionality in 700/800/900 MHz ISM band.

Figure 1-1. SAMR30 Module Xplained Pro



1. Battery header (J102)
2. Battery/LDO Selection header (J103)
3. Current measurement header (J104)
4. Power LED
5. USB header
6. XPRO Extension header
7. User LEDs
8. QTouch button
9. Reset button
10. User button
11. Cortex DBG (Debug) header

2. Getting Started

This chapter provides the prerequisites to start the evaluation with the SAMR30 Module Xplained Pro evaluation kit.

2.1 Xplained Pro Quick Start

This section provides the steps to explore the SAMR30 Module Xplained Pro platform. The SAMR30 Module XPro boards are programmed at factory with Performance Analyzer firmware along with AVR2054 bootloader. For the users with a fresh board from factory, follow instructions in [Section 2.1.1 Setup for Standalone Operation](#) and [Section 2.2.1 Programming Wireless Assembly using Atmel Studio 7.0](#) (skip Step 7 and 8) for setup and follow the instructions in [Section 2.2.2 Installing Wireless Composer 7.0 Extension in Atmel Studio 7.0](#) to install wireless composer and to get started with Performance Analyzer GUI.

The bootloader memory section (8kB) is write-protected at factory. To overwrite the write-protection, program the BOOTPROT bits[2:0] of NVM User Row with the default value of 0x7.

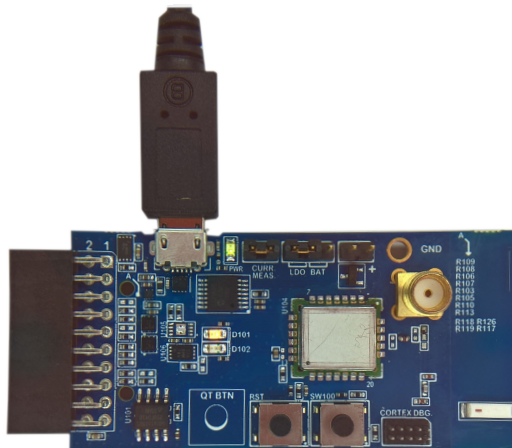
Customers not making use of the bootloader must program the BOOTPROT bits to default value to program the complete flash of the SAMR30 device. To download FW through bootloader, connect the board to PC as shown in [Figure 2-1](#) and follow the instructions to load application firmware to an MCU through the Bootloader PC tool given in the AVR2054 application note.

Once the Xplained Pro kit is powered, the green power LED glows. The target device can be programmed and debugged by an external programmer or debugger tool like Atmel-ICE or SAM-ICE™.

2.1.1 Setup for Standalone Operation

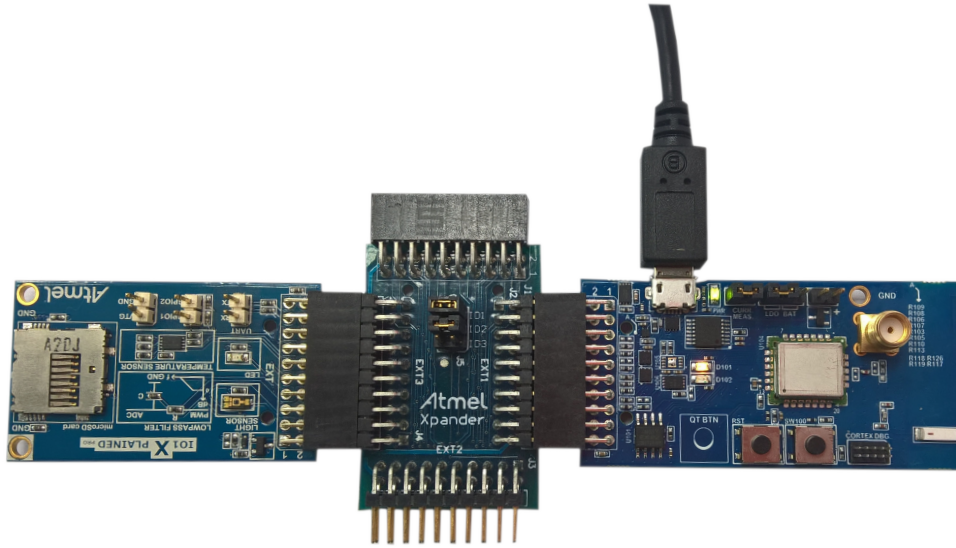
The SAMR30 module XPro is designed to operate in the standalone mode with an external programmer/debugger for evaluation. This requires the board to be powered from the USB header as shown in the following figure.

Figure 2-1. SAMR30 Module XPro Powered from USB Header



Any of the standard XPro Extension boards can be interfaced with the SAMR30 module XPro board using Xpander-XPro. The following is a sample image showing the reference for this setup.

Figure 2-2. SAMR30 Module XPro Interfaced with Standard XPro Extension Board



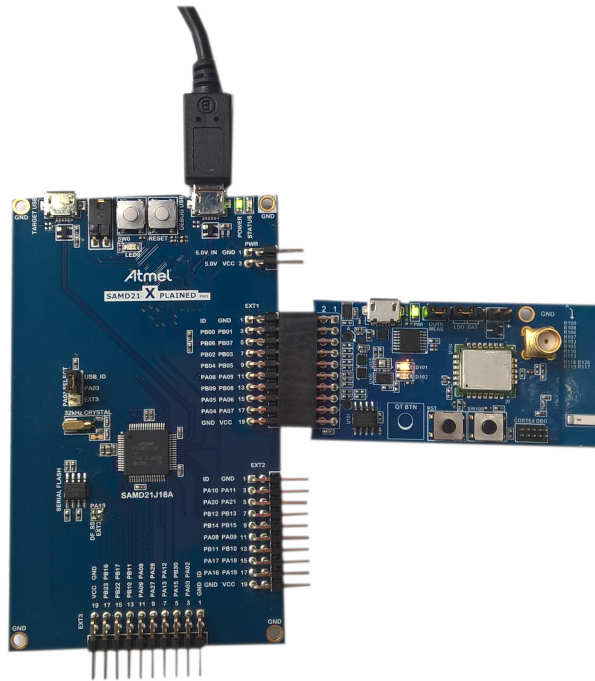
Note: Due to the limited number of available GPIOs in the ATSAMR30M18A module, few pins available in extension header of the board are multiplexed in the hardware through 0 Ohm resistors.

When interfacing with a standard XPro board, the user must verify the availability of GPIOs for interfacing.

2.1.2 Connecting XPro with XPro Extension

The SAMR30 module Xpro extension board is designed to connect with an Xplained Pro extension header (EXT1). However, it is compatible with all Xplained Pro EXT headers. See the pinouts of the corresponding Xplained Pro evaluation kit to find which Xplained Pro EXT headers can be used. The connection of the SAMR30 module XPro extension board with the SAM D21 Xplained Pro is shown in the following figure. Similarly, the extension board can also be connected with any other XPros. For more details, see [SAM D21 Xplained Pro Evaluation Kit Documentation](#).

Figure 2-3. Connecting SAM D21 Xplained Pro with SAMR30 Module XPro Extension



Initially, the XPro board must be programmed with the respective serial bridge firmware and the SAMR30 module XPro extension board must be programmed with Performance Analyzer firmware.

Note: By default, the Performance Analyzer example project for the SAMR30 module XPro is configured to operate in the standalone mode, that is, the UART (SIO2HOST) is configured to the UART interfaced with USB-UART convertor.

For evaluating the Performance Analyzer with an XPro board, the UART configuration in `conf_sio2host.h` file of the project in Atmel Studio must be modified for EXT header UART.

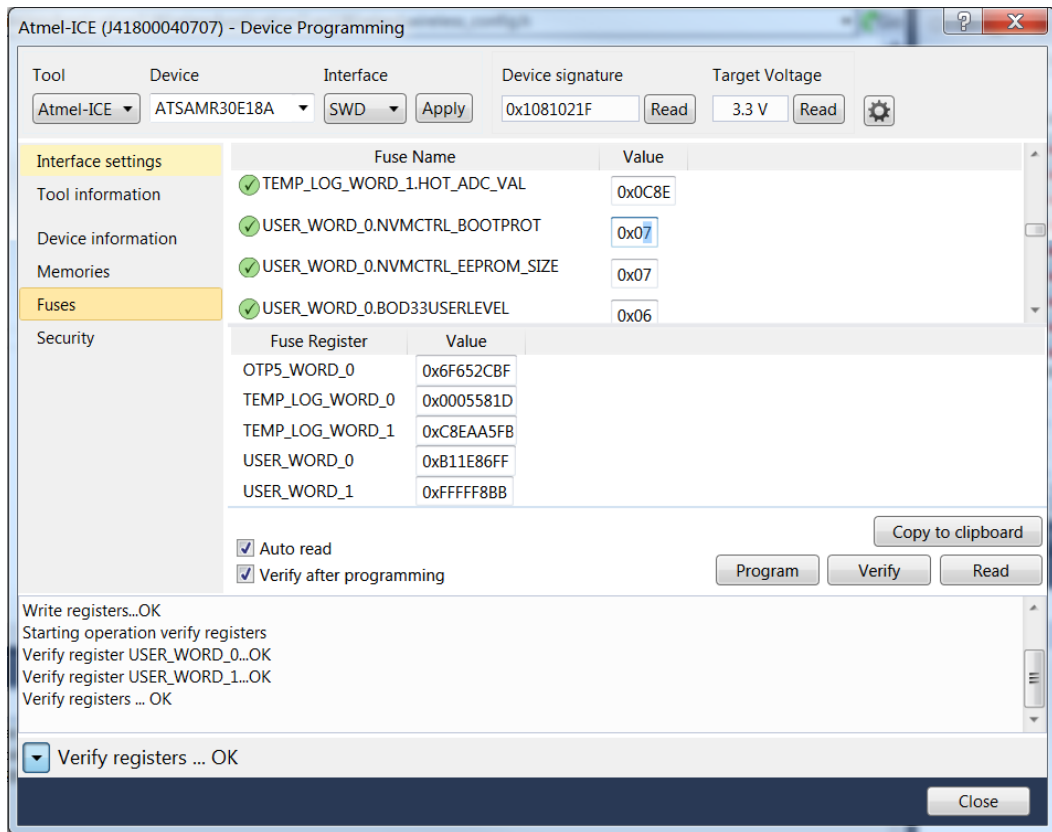
After programming both the XPro and extension boards, the Performance Analyzer GUI in Atmel Studio can connect with the SAMR30 wireless module on the extension board, which allows the user to change the channel, transmit power, modulation scheme, and so on. to perform RF tests. For more details on programming steps for both XPro and extension board, see [Programming Wireless Assembly using Atmel Studio 7.0](#).

2.1.3 Programming BOOTPROT Bits to Default Value

Perform the following steps to program BOOTPROT bits to default value.

1. Open Atmel Studio.
2. Choose **Device Programming** from Tools menu.
3. In the Device Programming window, set the following.
 - Tool – **Atmel-ICE** or **SAM-ICE**
 - Device – **ATSAMR30E18A**
 - Interface – **SWD**
4. Click **Read** to read the device signature and target voltage.
5. Click the **Fuses** tab in the left pane and enter **0x7** in the USER_WORD_0.NVMCTRL_BOOTPROT field.
6. Click **Program**.

Figure 2-4. Device Programming



2.2 Performance Analyzer

The Performance Analyzer firmware with a GUI (Wireless Composer Extension) in Atmel Studio provides a way to perform a number of basic RF functional tests. A quick-start guide and general help are available in the starting page of Performance Analyzer window of the Atmel Studio. The latest version of Atmel Studio is 7.0.

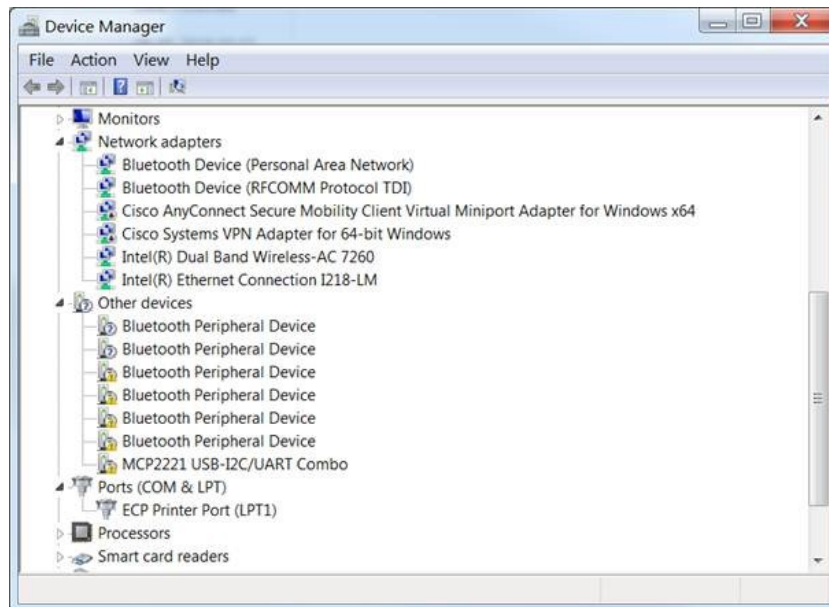
This section guides the user to install the necessary wireless extension, and to program the wireless assembly using Atmel Studio 7.0.

2.2.1 Programming Wireless Assembly using Atmel Studio 7.0

The following steps explain how to program the SAMR30 Module XPro board and get started with the Performance Analyzer application.

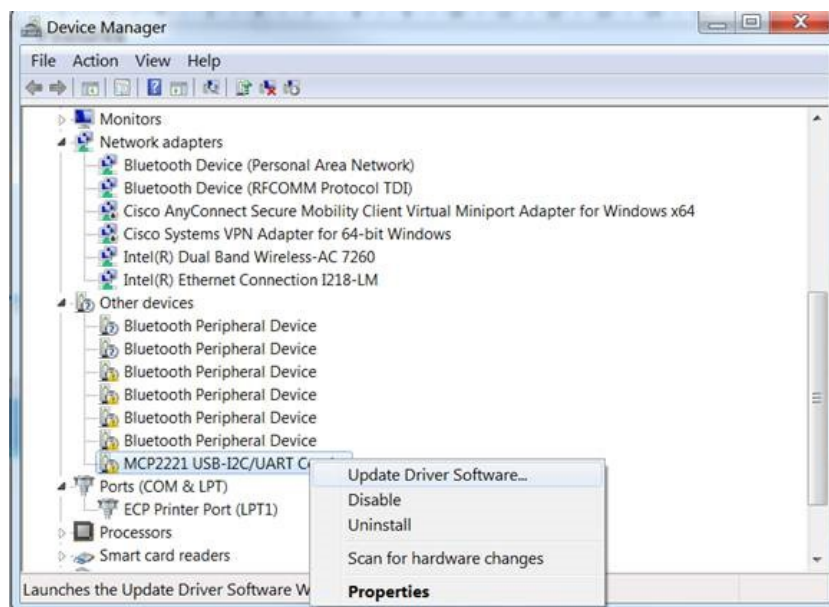
1. Connect the USB header of the SAMR30 Module XPro board with PC using the USB cable to power on the board. Virtual COM port driver installation begins and the driver installation fails.
2. Navigate to **Device Manager** (Start > Search for *Device Manager*). The connected device will be available under **Other devices** as **MCP2221 USB-I2C/UART Combo**.

Figure 2-5. Device Manager



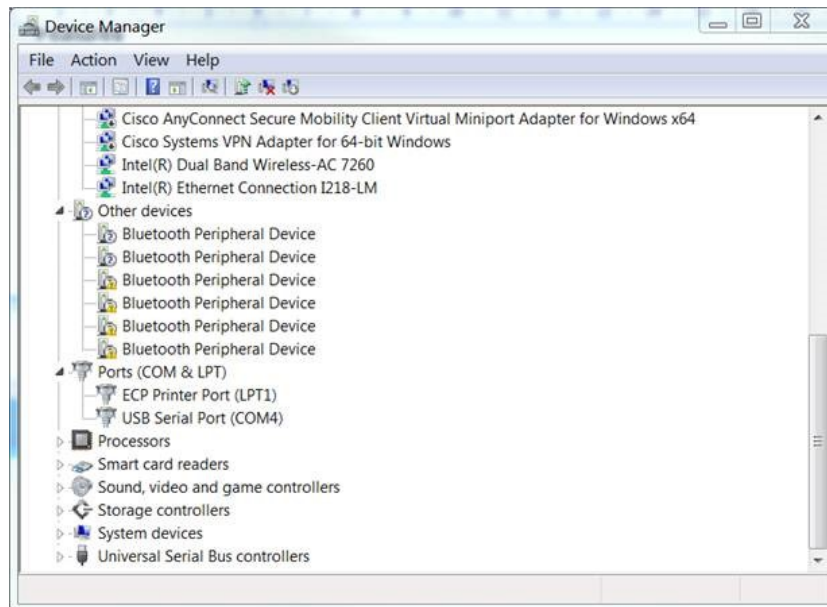
3. Right click **MCP2221 USB-I2C/UART Combo** device name and click **Update Driver Software....**

Figure 2-6. Update Driver Software



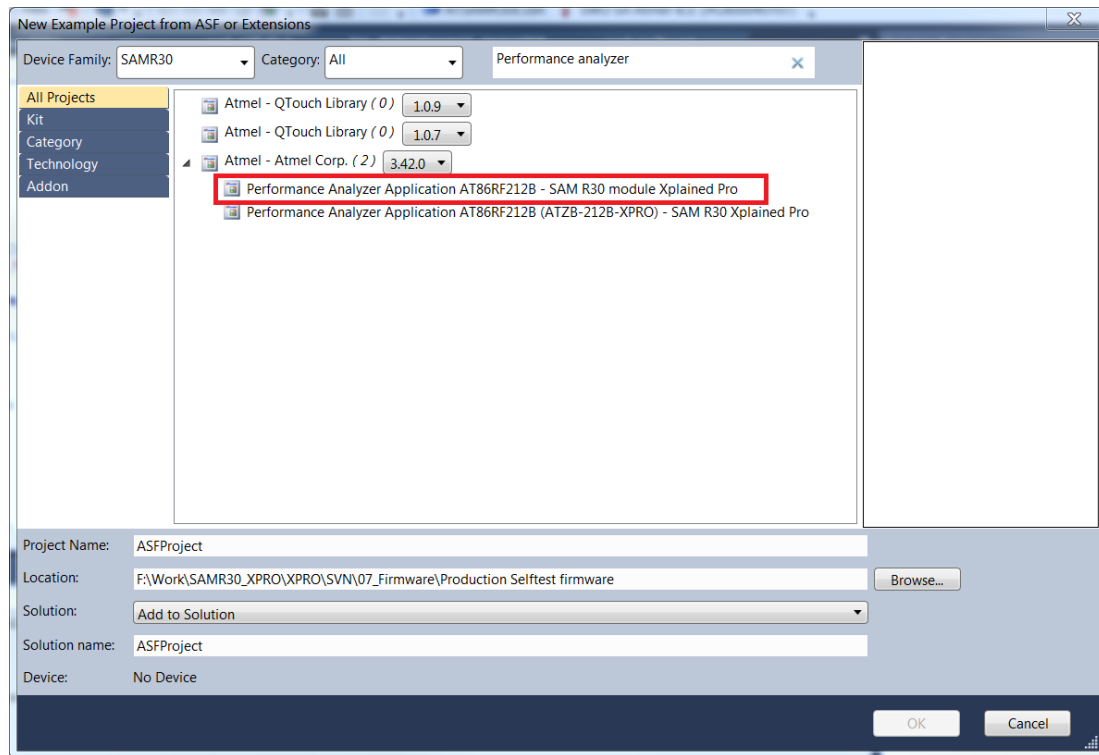
4. Download the MCP2221 USB driver files from the [MCP2221A webpage](#).
5. Select **Browse my computer for driver software** and specify the path of the folder containing the MCP2221 USB driver.
6. USB driver installation is complete and the device will be listed as **USB Serial Port** as shown in the following image. Note the COM number displayed next to the USB Serial Port from the Device Manager. This COM number is used to establish connection with the kit.

Figure 2-7. Device Manager Listing USB Serial Port



7. Connect the 10-pin 50 mil header from the programmer/debugger (like Atmel-ICE) with the Cortex DBG (Debug) header of SAMR30 Module XPro extension board.
8. Open Atmel Studio.
9. Navigate to the menu *File>New>Example Project*.
10. Select **SAMR30** from the Device Family drop-down list.
11. Enter **Performance analyzer** in the field "Search for Example Projects". Select "Performance Analyzer Application AT86RF212B - SAM R30 Module Xplained Pro". The example project will be created in the selected directory.

Figure 2-8. Selecting Performance Analyzer Application



12. After the project solution is successfully opened, initiate the Build by clicking 'Build solution' from Build menu.
13. Connect an external debugger like Atmel-ICE to SAMR30 Module XPRO as shown in the following figure.

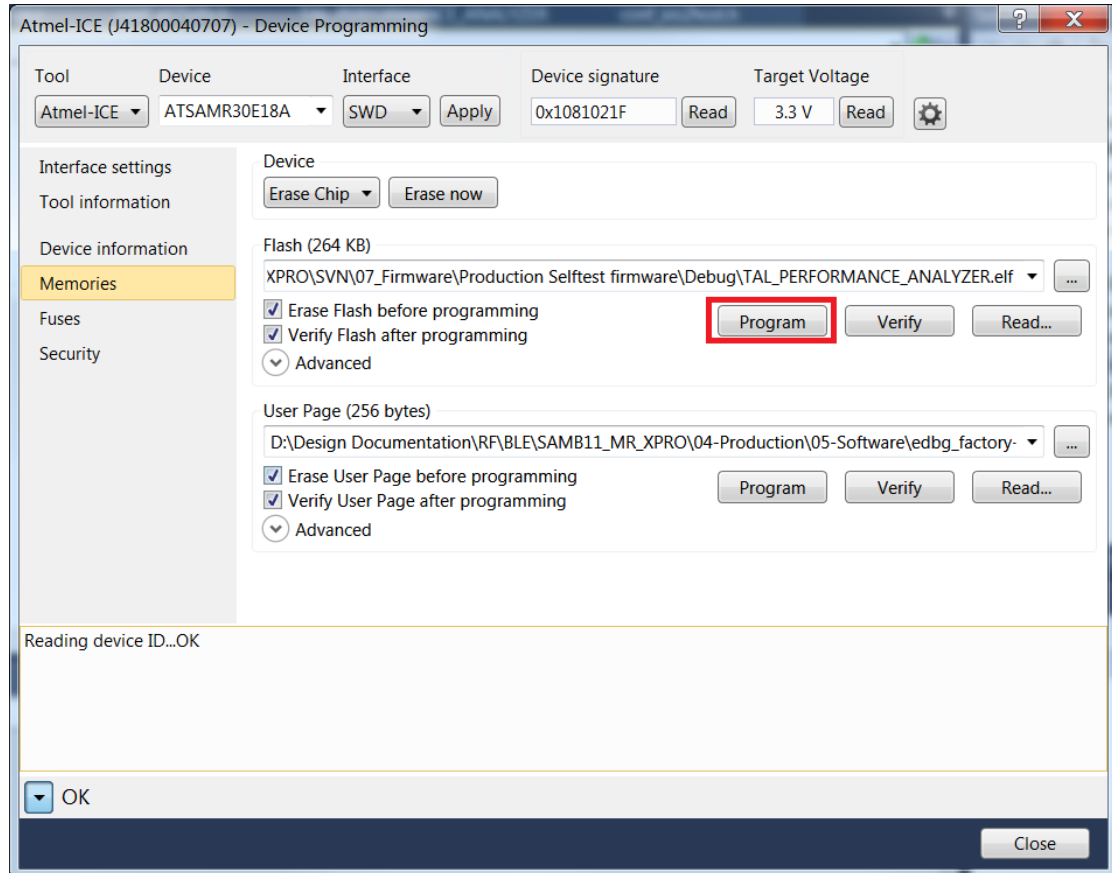
Figure 2-9. Connecting Programmer/Debugger with SAMR30 Module XPro Extension Board



14. After successful build completion, open the Device Programming window from the **Tools** menu.

15. In the Device Programming window, set the following.
 - Tool – **Atmel-ICE**
 - Device – **ATSAMR30E18A**
 - Interface – **SWD**
16. Click Read to read the device signature and target voltage.
17. Navigate to Memories tab, click Program.

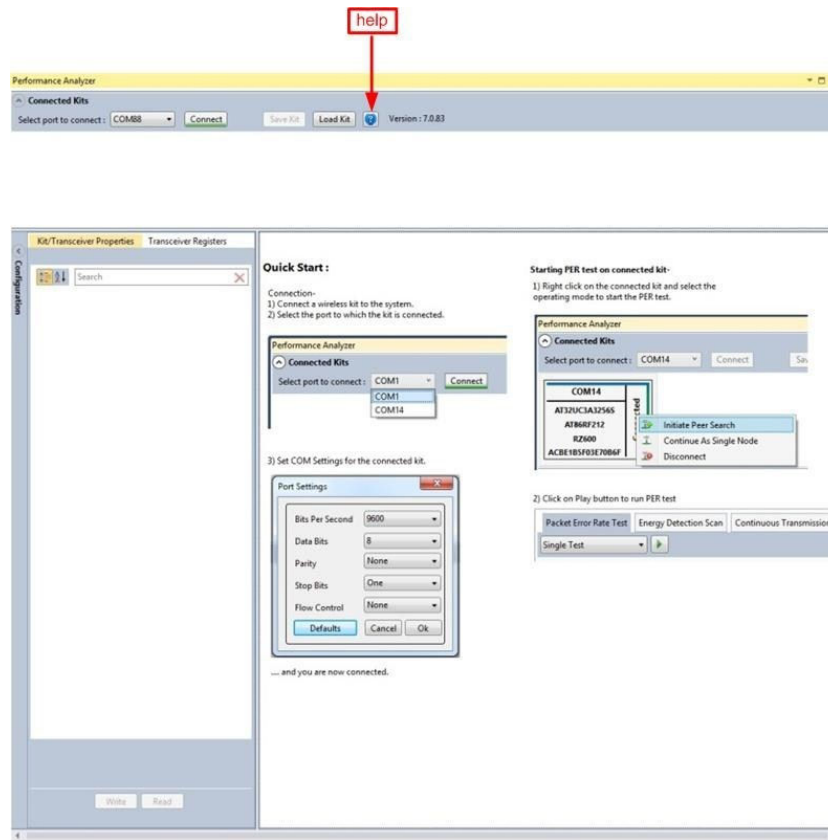
Figure 2-10. Device Programming



18. Open the Performance Analyzer GUI from the **Tools** menu in Atmel Studio.
19. Follow the Quick Start guidelines available in the starting page of Performance Analyzer window.
20. Select COM port, and click **connect**. The Performance Analyzer connects with SAMR30 Module XPro on the board.

The Performance Analyzer allows setting/changing of the parameters like Channel Page, Channel, TX Power Register Value, and so on. To perform various RF tests. For more details about the usage of the Performance Analyzer, click **help** as shown in the following figure.

Figure 2-11. Performance Analyzer - Help

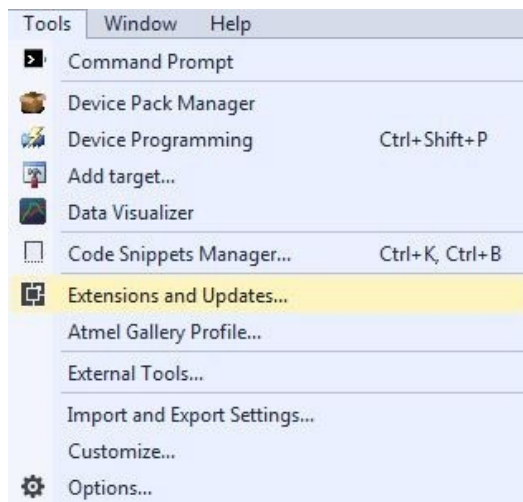


2.2.2 Installing Wireless Composer 7.0 Extension in Atmel Studio 7.0

The following steps explain how to install the necessary wireless extension tool in Atmel Studio 7.0.

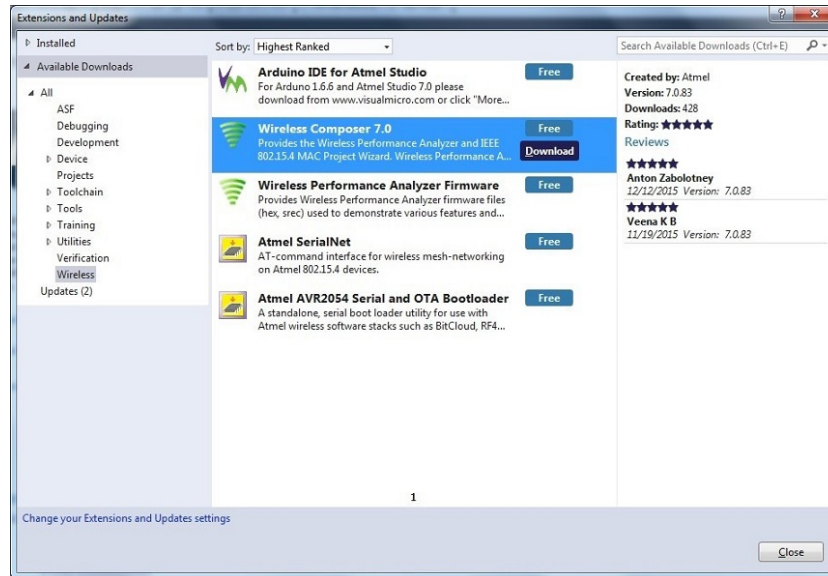
1. Install and open [Atmel Studio](#).
2. Go to Tools menu and click **Extensions and Updates...**

Figure 2-12. Extensions and Updates Menu Option

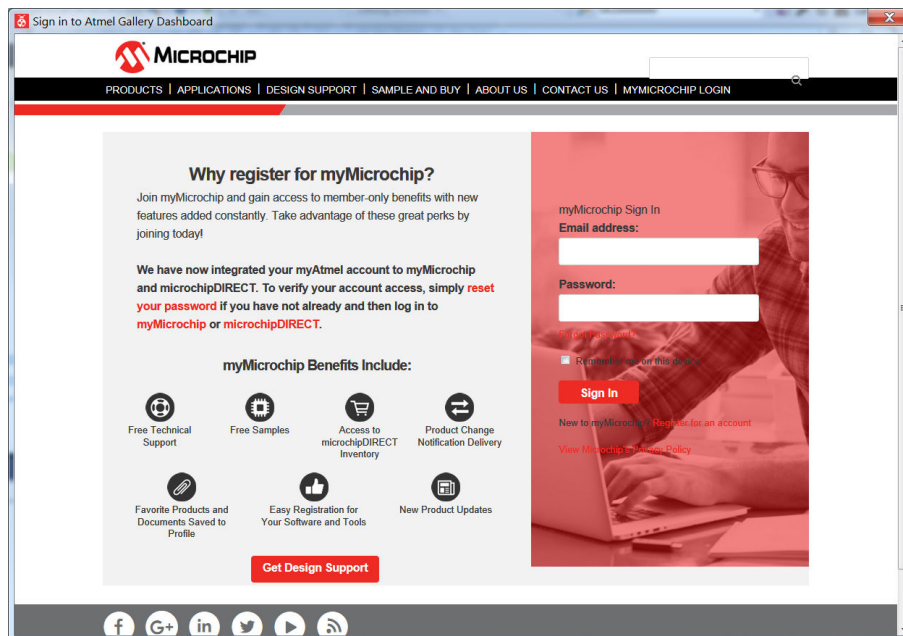


3. In the **Extensions and Updates** window, click **Available Downloads**.
4. Expand **All** options on the left navigation pane, and click **Wireless**.

5. Select **Wireless Composer 7.0** and click **Download**, which leads to Microchip Gallery.
Figure 2-13. Extensions and Updates Window

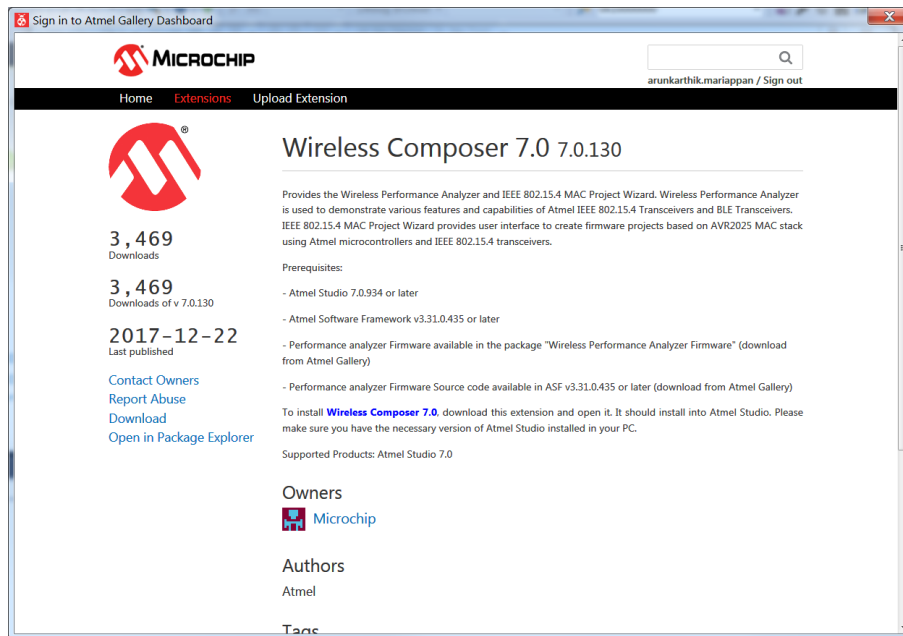


6. Log in to the Microchip Gallery with myMicrochip account.
Figure 2-14. Microchip Gallery Dashboard



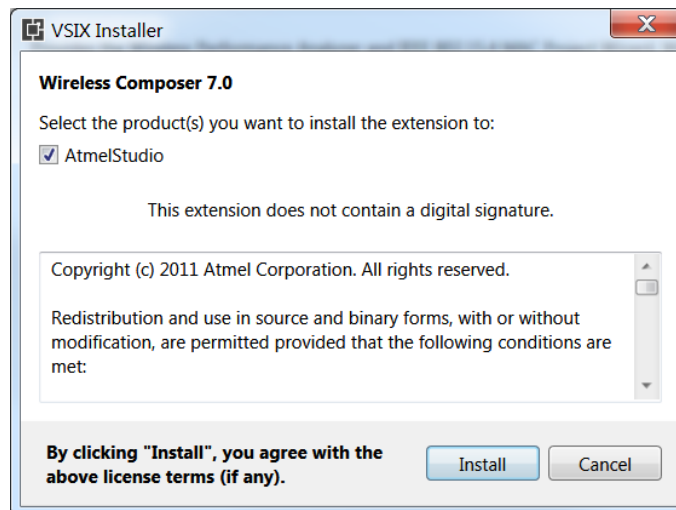
7. Search for **Wireless Composer** in the search bar and click the latest version.

Figure 2-15. Wireless Composer Page



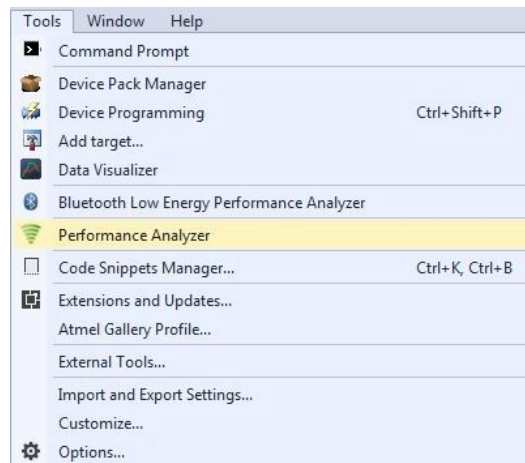
8. On the webpage of the extension, click **Download** and when prompted for file download, click **Open**. The extension automatically installs after completion of the download.
9. Install Wireless Composer.

Figure 2-16. VSIX Installer



10. Restart Atmel Studio after the installation. The Performance Analyzer GUI will be available in the Tools menu.

Figure 2-17. Performance Analyzer Menu Option



2.3 Design Documentation and Relevant Links

Following is a list of links to the most relevant documents and software for the SAMR30 module XPro extension board:

- [Xplained Pro products](#)— Xplained Pro is a series of small-sized and easy-to-use evaluation kits for Microchip microcontrollers and other Microchip products. It consists of a series of low-cost MCU boards for evaluation and demonstration of features and capabilities of different MCU families.
- [SAMR30 Module XPro Design Documentation](#) package containing schematics, BOM, assembly drawings, 3D plots, layer plots, and so on.
- [Atmel Studio](#), free Microchip IDE for development of C/C++ and assembler code for Microchip microcontrollers.
- [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.
- [Wireless composer](#) provides the Wireless Performance Analyzer and IEEE 802.15.4 MAC Project Wizard. Wireless Performance Analyzer is used to demonstrate various features and capabilities of Microchip IEEE 802.15.4 Transceivers and BLE Transceivers.
- [SAMR30 Module XPro product page](#).
- [ATSAMR30M18A](#) – Product page for the SAMR30 wireless module
- [ATSAMR30E18A](#) – Product page for the ATSAMR30 ARM Cortex M0+ based wireless microcontroller.
- [ATSHA204A-MAHCZ-T](#) – Product page for the Standard XPro extension board ID chip.
- [AT30TSE758A](#) – Product page of on-board Digital temperature sensor
- [ATECC508A](#) – Product page for CryptoAuthentication IC
- [ATECC608A](#) – Product page for CryptoAuthentication IC
- [AT25DF041B-SSH-N-T](#) – Product page for on-board SPI Flash
- [MCP2221A](#) – Product page for MCP2221A, USB 2.0 to I²C/UART protocol converter with GPIO
- [AVR2054 Application Note](#).

3. Xplained Pro

The Xplained Pro is an evaluation platform that provides the full Microchip microcontroller experience. The platform consists of a series of Microcontroller (MCU) boards and extension boards that are integrated with Atmel Studio, which has Advanced Software Framework (ASF) drivers and demo code to support data streaming, and more. The Xplained Pro MCU boards support a wide range of Xplained Pro extension boards, which are connected through a set of standardized headers and connectors. Each extension board has an identification (ID) chip to uniquely identify which boards are connected to an Xplained Pro MCU board. This information is used to present relevant user guides, application notes, data sheets, and example code through Atmel Studio.

3.1 Hardware Identification System

All Xplained Pro compatible extension boards have a Microchip ATSHA204 CryptoAuthentication chip mounted. 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 MCU board, the information is read and sent to Atmel Studio. The Atmel extension kits installed with Atmel Studio provide information, code examples, and links to relevant documents. 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 contain one or more dual row, 20-pin, 100 mil extension header(s). The Xplained Pro MCU boards have male headers, while Xplained Pro extensions have their female counterparts.

Note: All pins are not always connected.

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 MCU on Xplained Pro MCU boards directly.

The following table provides the pin description of all the connected pins.

Pin Number	Name	Description
1	ID	Communication line to the ID chip on an extension board
2	GND	Ground

.....continued

Pin Number	Name	Description
3	ADC(+)	Analog-to-Digital converter, alternatively positive part of differential ADC
4	ADC(-)	Analog-to-Digital converter, alternatively negative part of differential ADC
5	GPIO1	General purpose I/O
6	GPIO2	General purpose I/O
7	PWM(+)	Pulse width modulation, alternatively positive part of differential PWM
8	PWM(-)	Pulse width modulation, alternatively negative part of differential PWM
9	IRQ/GPIO	Interrupt request line and/or general purpose I/O
10	SPI_SS_B/ GPIO	Slave select for SPI and/or general purpose I/O
11	I2C_SDA	Data line for I ² C interface
12	I2C_SCL	Clock line for I ² C interface
13	UART_RX	Receiver line of target device UART
14	UART_TX	Transmitter line of target device UART
15	SPI_SS_A	Slave select for SPI. This pin must be preferably unique.
16	SPI_MOSI	Master out slave in line of serial peripheral interface
17	SPI_MISO	Master in slave out line of serial peripheral interface
18	SPI_SCK	Clock for serial peripheral interface
19	GND	Ground
20	VCC	Power for extension board

4. Hardware Specifications

This chapter explains the connectors, headers, and other peripherals of the SAMR30 module XPro.

4.1 Headers and Connectors

4.1.1 SAMR30 Module XPro Extension Header (J100)

The SAMR30 module XPro has a standard Xplained Pro Extension Header (EXT) which is a 20-pin 100 mil pitch female header. This header helps to connect the board to any Xplained Pro MCU board. The pinout definition for the extension header is shown in the following table.

Table 4-1. SAMR30 Module XPro Extension Header (J100)

Pin on EXT	Function	ATSAMR30 Module Pin	Description	Shared Functionality
1	ID_DATA	-	Communication line to ID chip	-
2	GND	GND	Ground	-
3	ADC(+)	PA06	AIN[6]; ADC pin. Connected by default. This pin can be disconnected by unmounting R106.	EXT pin 9 and QTouch Button
4	ADC(-)	-	Not Connected (NC)	-
5	GPIO	PA14	GPIO. Not connected by default. This pin can be connected by mounting R109.	EXT pin 13 and user LED 1 (D101)
6	GPIO	-	NC	-
7	PWM(+)	-	NC	-
8	PWM(-)	-	NC	-
9	IRQ/GPIO	PA06	GPIO. Not Connected by default. This pin can be connected by mounting R107.	EXT pin 3 and QTouch Button
10	SPI_SS_B/GPIO	PA28	GPIO. Connected by default. This pin can be disconnected by unmounting R103.	Alert pin of Temperature sensor
11	TWI_SDA	PA08	SERCOM0/PAD[0]. I ² C Serial Data Line (SDA) for data transfer.	SDA – Temperature sensor , ATECC608A and USB-UART/I²C convertor
12	TWI_SCL	PA09	SERCOM0/PAD[1]. I ² C Serial Clock Line (SCL) for the bus clock.	SCL – Temperature sensor , ATECC608A and USB-UART/I²C convertor

.....continued

Pin on EXT	Function	ATSAMR30 Module Pin	Description	Shared Functionality
13	UART_RX	PA14	SERCOM2/PAD[2]. UART Transmit line of SAMR30. Connected by default. This pin can be disconnected by unmounting R108.	EXT pin 5 and user LED 1(D101)
14	UART_TX	PA15	SERCOM2/PAD[3]. UART Receive line of SAMR30	-
15	SPI_SS_A	PA17	SERCOM1/PAD[1]. Slave select for SPI.	-
16	SPI_MOSI	PA18	SERCOM1/PAD[2]. Master out slave in line of SPI.	MOSI of SPI Flash and user LED 2(D102)
17	SPI_MISO	PA16	SERCOM1/PAD[0]. Master in slave out line of Serial peripheral interface. MISO of SPI Flash.	MISO of SPI Flash
18	SPI_SCK	PA19	SERCOM1/PAD[3]. Clock for Serial peripheral interface. SCK of SPI Flash.	SCK of SPI Flash
19	GND	GND	Ground	-
20	VCC_TARGET	-	Power for extension board	-

4.1.2 USB Header (J101)

The USB Header (J101) is used for supplying power to the board and for interfacing the UART from ATSAMR30M18A through the on-board UART-USB converter. For more details, see [4.2.7 USB-UART/I2C Converter \(U103\)](#).

4.1.3 Battery Header (J102)

A battery can be used to power-up the board using the Battery Header (J102). The positive terminal of the header is marked with '+' in the PCB silk screen. This is a secondary option to power-up the board. This mode of power-up can be used for operating in the standalone mode. The primary mode of power source is through the USB header. J102 can also be used to evaluate the ATSAMR30M18A module across operating voltage range (1.8 V to 3.6 V) with power supplied from a standard bench power supply. To power the board from the battery header, place a jumper cap between pins 1 and 2 of Battery/LDO Selection header (J103)

4.1.4 Battery/LDO Selection Header (J103)

The Battery/LDO Selection Header is used to select between the power, supplied through the LDO/EXT header, and the battery header. This board has an on-board discrete power multiplexer, which chooses between the power supplied from the USB header and the EXT header. Among the two, the highest priority is assigned for the USB header.

Table 4-2. Battery/LDO Selection Header Pin Details

Pin on Connector	Description
1	Power from battery header
2	Power to the module
3	Power from either USB header or EXT header

For powering the board from the battery, place the jumper cap between pins 1 and 2 of J103. For powering the board from either USB header or EXT header, place the jumper cap between pins 2 and 3 of J103.

4.1.5 Current Measurement Header (J104)

The Current Measurement Header (J104) can be used to measure the current consumed by the ATSAMR30M18A module. To measure the current consumption, perform the following:

1. Remove the power supply to the board
2. Remove the jumper cap placed over J104
3. Connect an ammeter/multimeter across the pins of J104
4. Provide power supply to the board

4.1.6 Serial Wire Debug Header (J105)

The Serial Wire Debug (SWD) Header is available on the board for programming and debugging the ATSAMR30M18A wireless module. The pinout of this header is compatible with the SAM connector port of the Atmel-ICE. The header can be interfaced with SAM-ICE using the ATATMEL-ICE-ADPT accessory kit.

Table 4-3. SWD Header

Pin on Connector	Module Signal
1	VCC_P3V3
2	SWDIO
3	GND
4	SWDCLK
5	GND
6	NC
7	NC
8	NC
9	GND
10	RESET

4.2 Peripherals

The following sections describe the peripherals and connection details of the SAMR30 Module Xplained Pro.

4.2.1 LED

There are two user LEDs (Yellow – D101 and Green – D102) on the board that can be optionally controlled by the SAMR30 module. The LEDs can be activated by driving the connected I/O line to GND.

The SAMR30 Module XPro board also contains one power indication LED (Green – D103).

Table 4-4. LED Functions

SAMR30 Pin	Function	Shared Functionality
PA14	Yellow LED D101. Connected by default. This pin can be optionally disconnected by unmounting R122.	UART TX of the SAMR30 and EXT Pin 5
PA18	Green LED D102. Connected by default. This pin can be optionally disconnected by unmounting R123.	SPI MOSI of the SAMR30

4.2.2 Mechanical Buttons

The SAMR30 Module Xplained Pro contains two mechanical buttons:

- RESET button connected to the SAMR30 reset line.
 - When the RESET button is pressed, the reset line is driven to GND.
- Generic user-configurable button. This GPIO can be used as a wake-up source from the Backup mode of the SAMR30.
 - When user-configurable button is pressed, the I/O line is driven to GND.

Table 4-5. Mechanical Buttons Functions

SAMR30 Pin	Silkscreen Text	Shared Functionality
RESET	RST	-
PA07	SW100	-

4.2.3 QTouch Button

A self capacitance button is available on the SAMR30 Module Xplained Pro board that can be used as user input. This QTouch button is driven by the built-in Peripheral Touch Controller (PTC) of the SAMR30. The 10 kOhm resistor in series to the QTouch button can be optionally removed to disconnect the QTouch button from the module pin (PA06). This 10 kOhm series resistor improves the noise immunity of the QTouch button.

Table 4-6. QTouch Button Functions

SAMR30 Pin	Silkscreen Text	Shared Functionality
PA06	QT BTN	EXT pin 3 and 9

4.2.4 Temperature Sensor (U106)

The SAMR30 Module Xplained Pro has an on-board digital temperature sensor, AT30TSE758A. This sensor is interfaced with the SAMR30 through I²C bus and is available on I²C slave address 0x48 (7-bit MSb address).

The AT30TSE758A also has a serial EEPROM which is accessible through the same I²C bus with the slave address as 0x50 (7-bit MSb address).

Table 4-7. Temperature Sensor Functions

SAMR30 Pin	Function	Shared Functionality
PA08	I ² C SDA	ATECC608A , USB-UART/I²C convertor and EXT pin 11
PA09	I ² C SCL	ATECC608A , USB-UART/I²C convertor and EXT pin 12
PA28	Alert. Not connected by default. Could be connected by mounting R126.	EXT pin 10

4.2.5 CryptoAuthentication Device (U105)

The SAMR30 Module Xplained Pro has a footprint provision for evaluating the Microchip CryptoAuthentication ICs (ATECC508A and ATECC608A). The following table lists the interfaces between the CryptoAuthentication IC and SAMR30.

Table 4-8. Crypto Authentication Device Functions

SAMR30 Pin	Function	Shared Functionality
PA08	I ² C SDA	Temperature sensor , USB-UART/I²C convertor and EXT pin 11
PA09	I ² C SCL	Temperature sensor , USB-UART/I²C convertor and EXT pin 12

4.2.6 Serial Flash (U101)

The SAMR30 Module Xplained Pro has an on-board 4 Mb SPI Flash for non-volatile storage of data.

Table 4-9. Serial Flash Functions

SAMR30 Pin	Function	Shared Functionality
PA16	SPI MISO	EXT pin 17
PA18	SPI MOSI	EXT pin 16
PA19	SPI SCK	EXT pin 18
PA27	SPI SS/GPIO	-

4.2.7 USB-UART/I²C Convertor (U103)

The SAMR30 Module Xplained Pro has an on-board USB-UART/I²C convertor primarily used as a Virtual Com port gateway by using one of the SAMR30 UARTs.

Table 4-10. USB-UART/I²C Convertor Functions

SAMR30 Pin	Function	Shared Functionality
PA08	I ² C SDA	Temperature sensor , ATECC608A and EXT pin 11
PA09	I ² C SCL	Temperature sensor , ATECC608A and EXT pin 12
PA24	SERCOM3 PAD[2]. UART TX of the SAMR30	-

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.....continued

SAMR30 Pin	Function	Shared Functionality
PA25	SERCOM3 PAD[3]. UART RX of the SAMR30	-

5. Regulatory Notice

This equipment (SAMR30 Module Xpro / A09-3182) is intended for laboratory evaluation purposes only. The following regulatory notices are to cover the requirements under the regulatory approval.

When this module is used in USA/Canada, the user must restrict the operating frequency band within 902-928 MHz. Regulatory compliance settings have to follow the ATSAMR30M18A module certifications.

5.1 United States

The SAMR30 Module Xpro contains ATSAMR30M18A module which has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” single-modular approval in accordance with Part 15.212 Modular Transmitter approval.

Contains Transmitter Module FCC ID: 2ADHKR30M.

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

5.2 Canada

The SAMR30 Module Xpro contains ATSAMR30M18A module which has been certified for use in Canada under Innovation, Science, and Economic Development (ISED, formerly Industry Canada) Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247.

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference;
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmitter Antenna (From Section 6.8 RSS-GEN, Issue 5, April 2018): User manuals, for transmitters shall display the following notice in a conspicuous location:

This radio transmitter [IC: 20266-R30M] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio [IC: 20266-R30M] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

For a list of approved antennas, refer to [Table 5-1](#).

5.3 Europe

This equipment (A09-3182) has been assessed under the Radio Equipment Directive (RED) for use in European Union countries. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Radio Equipment Directive.

Furthermore, the manufacturer must maintain a copy of the module's documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.



Important: On account of the nature of radio equipment, the height of the CE marking affixed to radio equipment may be lower than 5 mm, provided it remains visible and legible. For more detailed information about CE marking requirements, refer to [Article 19](#) of “DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL” of 16 April 2014.

SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, Microchip Technology Inc. declares that the radio equipment type [A09-3182] is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following URL (refer product specific pages): <http://www.microchip.com/design-centers/wireless-connectivity/>.

5.4 Antenna Considerations

The following table provides the list of approved external antennas along with the manufacturer and part number details.

Table 5-1. Approved Antennas

Manufacturer	Part Number	Antenna Type	Peak Gain	Operating Frequency
Linx Technologies	ANT-916-CW-QW-SMA/ANT-916-CW-QW ⁽¹⁾	Monopole antenna	1.8 dBi	865-965 MHz
Pulse Electronics	W1910/W1911 ⁽¹⁾	Monopole Antenna	1.0 dBi	824-960 MHz, and 1710-2170 MHz

Note:

1. The SMA connector is intended to be used only for laboratory evaluation purposes. For field usage in USA/Canada, the antenna port must be of type RP (Reverse Polarity)-SMA.

6. Hardware Revision History and Known Issues

6.1 Identifying Product ID and Revision

The revision and product identifier of the SAMR30 Module Xplained Pro 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-xxxx Rev rr, where xxxx 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 the SAMR30 Module Xplained Pro is A09-3182.

6.2 Revision 4

Added option to bypass (through a 0R(R133) resistors which is not populated by default) the on-board power switch to allow the power supply from USB header to supply external boards connected to EXT header. This will be needed for standalone operation of the board with extension boards, indicated in section 2.1.1.

Inserted 100ohm series resistors for module pins 3, 4, 6, 17, 19 and 20.

6.3 Revision 3

PCBA label has been updated to include final regulatory IDs.

6.4 Revision 2

Revision 2 is the initial revision of the SAMR30 Module Xplained Pro.

7. Appendix

7.1 Connecting a SAM-ICE to an Xplained Pro Board

The Xplained Pro kits that feature a 10-pin 50-mil debug connector can use external debug tools like SAM-ICE or Atmel-ICE for programming/debugging. Evaluation kits with devices using the SWD interface on-board have a connector that is pinout-compatible with the Cortex Debug Connector.

The SAM-ICE is connected to the debug connector on an Xplained Pro using either an Atmel-ICE adapter, SAM-ICE adapter, or a 10-pin 50-mil header to squid cable. When using a squid cable, see the following table and figures for how to connect the SAM-ICE to the Xplained Pro board.

Table 7-1. Squid Cable Connections

Squid Cable Pin	SAM-ICE Pin
1 (VCC)	1 (VTref)
2 (SWDIO/TMS)	7 (TMS)
3 (GND)	4 (GND)
4 (SWCLK/TCK)	9 (TCK)
5 (GND)	6 (GND)
6 (SWO/TDO)	13 (TDO) ⁽¹⁾
7 (Not used)	-
8 (Not used)	-
9 (Not used)	-
10 (RESET)	15 (RESET)

Note:

- Optional pin is used only when the device functionality supports TDO.

Figure 7-1. SAM-ICE using a Squid Cable



Figure 7-2. SAM-ICE using an Atmel-ICE Adapter



8. Document Revision History

Revision	Date	Section	Description
A	12/2018	Document	Initial release

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ISBN: 978-1-5224-4007-9

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