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## mikroBUS™ Xplained Pro

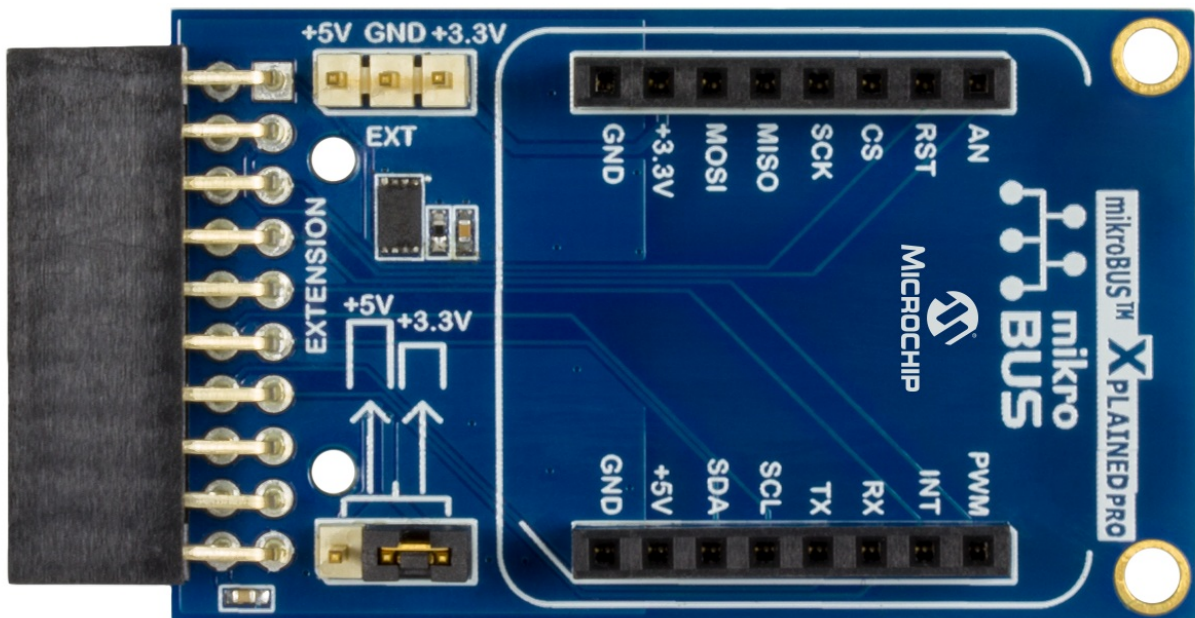
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### Description

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The mikroBUS™ Xplained Pro is an extension board in the Xplained Pro evaluation platform. It is designed to demonstrate mikroBUS™ click boards with Xplained Pro MCU boards.

**Figure 1. mikroBUS™ Xplained Pro**



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## 1. Introduction

The mikroBUS™ Xplained Pro is an extension board to communicate between Xplained Pro MCU boards and mikroBUS™ click boards via I<sup>2</sup>C (SDA, SCL), SPI (MISO, MOSI, SCK, CS), UART (RX, TX), INT, AN, and PWM lines. The board is designed to operate at +3.3V and +5V power supply.

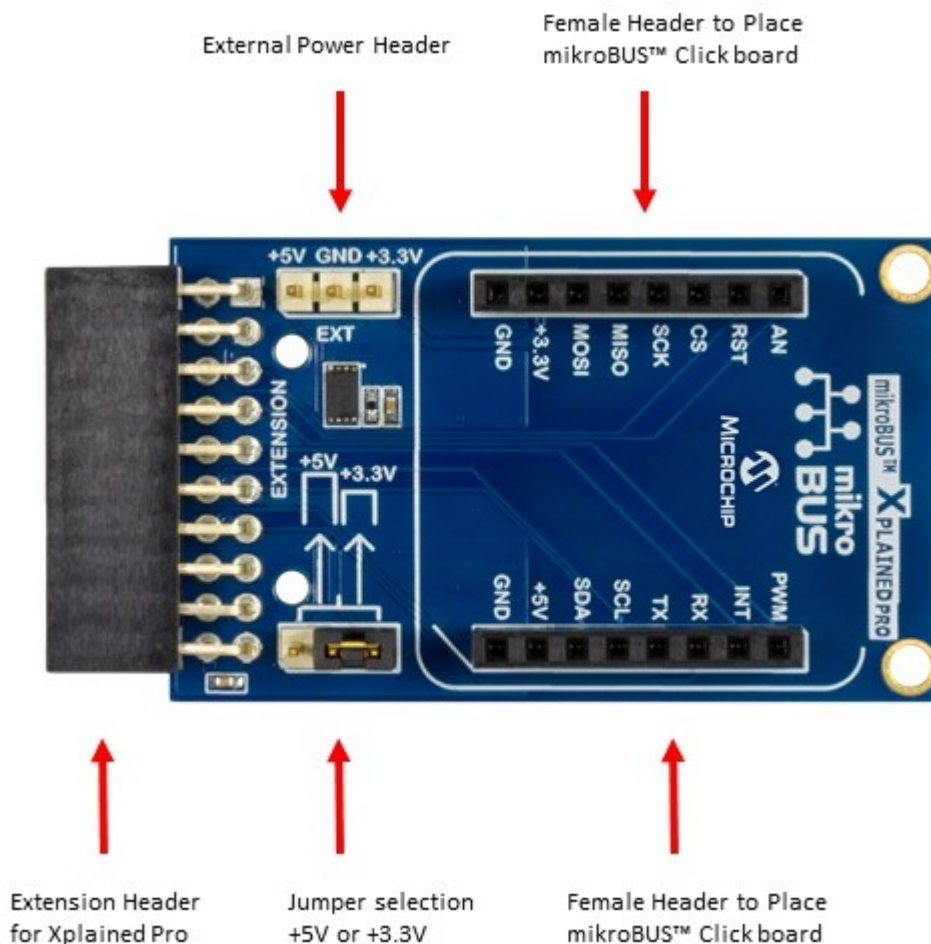
### 1.1 Features

- Adapter PCB for all mikroBUS™ Click boards
- Xplained Pro Hardware identification system using ATSHA204A
- Jumper selection to choose voltage level +3.3V or +5V
- External Power Header

### 1.2 Kit Overview

The mikroBUS™ Xplained Pro is an extension board, which contains the female header to connect mikroBUS™ click boards to the Xplained Pro MCU boards. The kit can be connected to any extension header on the Xplained Pro MCU board.

Figure 1-1. mikroBUS™ Xplained Pro



## 2. Getting Started

### 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 mikroBUS Xplained Pro 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 links to the most relevant documents and software for the mikroBUS Xplained Pro.

- [Xplained products](#) – Xplained evaluation kits are a series of easy-to-use evaluation kits for microcontrollers and other products. For low pin-count devices, the Xplained Nano series provides a minimalistic solution with access to all I/O pins of the target microcontroller. Xplained Mini kits are for medium pin-count devices and adds Arduino Uno compatible header footprint and a prototyping area. Xplained Pro kits are for medium to high pin-count devices, and feature advanced debugging and standardized extensions for peripheral functions. All these kits have on board programmers/ debuggers which creates a set of low-cost boards for evaluation and demonstration of features and capabilities of different products.
- [Atmel Studio](#) – Atmel Studio presents Free Atmel IDE for development of C/C++ and assembler code for microcontrollers and relevant documentation.
- [Microchip sample store](#) – Microchip sample store where you can order samples of devices.
- [EDBG User Guide](#) – User guide with more information about the on-board Embedded Debugger.
- [IAR Embedded Workbench® for ARM®](#) – This is a commercial C/C++ compiler that is available for ARM®. There is a 30-day evaluation version as well as a code size limited kick-start version available from their website. The code size limit is 16 KB for devices with M0, M0+, and M1 cores and 32 KB for devices with other cores.
- [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.

## 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 Advanced Software Framework (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 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 3-1. 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 <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.

Pin Number	Pin Name	Description
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.

## 3.2 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 3-2. 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

## 4. Hardware Users Guide

### 4.1 ID Chip Content

mikroBUS Xplained Pro can be connected to several Xplained Pro MCU boards. Xplained Pro MCU board(s) that does not have 3.3V as its primary target voltage will read all ID devices on connected extensions to check if they support the target voltage before enabling it to the extension headers. The table below shows the static content written in the ID chip.

**Table 4-1. mikroBUS Xplained Pro ID Chip Content**

Data Field	Content
Product name	mikroBUS Xplained Pro
Minimum operation voltage	1.8V
Maximum operation voltage	5.5V
Maximum current	10 mA

#### Related Links

[Hardware Identification System](#)

### 4.2 Extension Header

mikroBUS Xplained Pro implements all the Xplained Pro Standard Extension Headers (Female), which makes it possible to connect the board to an Xplained Pro MCU board. The pin-out definition for the extension header to mikroBUS™ Click Board Header can be seen in the table below.

**Table 4-2. mikroBUS Xplained Pro Extension Header**

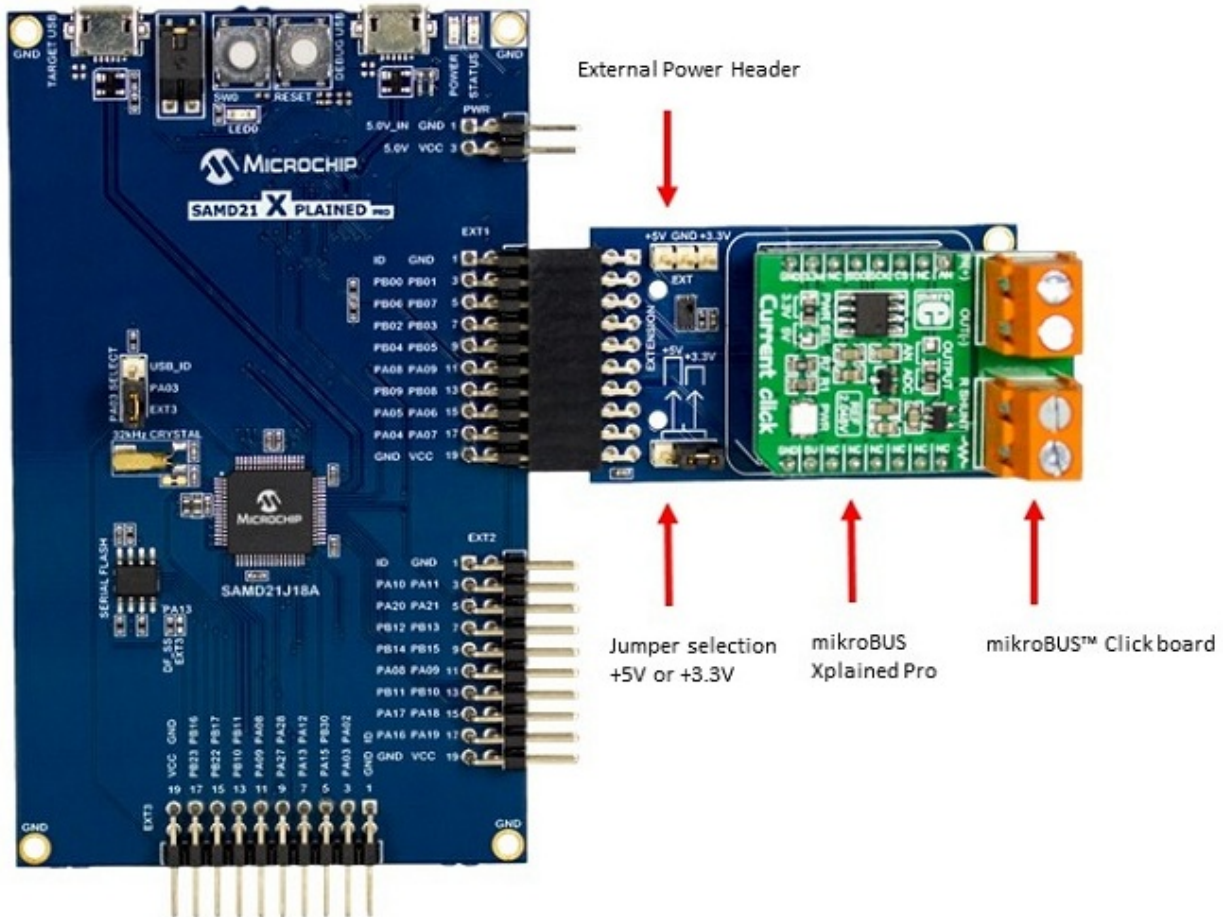
Pin on EXT1	Pin Function on Click Board	Description
1	ID	Communication line to the ID chip
2	GND	Ground
3	AN	Analog
4	NC	Not connected
5	RST	Reset
6	NC	Not connected
7	PWM	Pulse Width modulation
8	NC	Not connected
9	INT	Interrupt
10	NC	Not connected
11	TWI_SDA	I <sup>2</sup> C SDA
12	TWI_SCL	I <sup>2</sup> C SCL

Pin on EXT1	Pin Function on Click Board	Description
13	UART_TXD	UART TX
14	UART_RXD	UART RX
15	SPI_SS_A	SPI SS
16	SPI_MOSI	SPI MOSI
17	SPI_MISO	SPI MISO
18	SPI_SCK	SPI Clock
19	GND	Ground
20	V <sub>CC</sub>	Target supply voltage

### 4.3 Functional Description

The mikroBUS Xplained Pro connects Xplained Pro MCU and mikroBUS™ click board. Both boards must be used only at the same operating voltage (either +5V or +3.3V) by placing Jumper. Externally, mikroBUS™ click board can be powered (either +5V or +3.3V) by EXT header.

**Figure 4-1. mikroBUS™ Xplained Pro Extension Board with Xplained Pro MCU and mikroBUS™ Click Board**





## 5. Hardware Revision History and Known Issues

### 5.1 Identifying Product ID and Revision

The revision and product identifier of the Xplained Pro boards can be found in two ways: either through Atmel Studio or by looking at the sticker on the bottom side of the PCB.

When an Xplained Pro MCU board is connected to a computer with Atmel Studio running, an information window with the serial number is shown. The first six digits of the serial number contain the product identifier and revision. Information about connected Xplained Pro extension boards is also shown in the window.

The same information can be found on the sticker on the bottom side of the PCB. Most kits have stickers that have the identifier and revision printed in plain text as A09-nnnn\rr, where nnnn is the identifier and rr is the revision. Boards with limited space have a sticker with only a data matrix code, which contains a serial number string.

The serial number string has the following format:

```
"nnnnrrssssssss"  
n = product identifier  
r = revision  
s = serial number
```

The product identifier for the mikroBUS Xplained Pro is A09-2841.

### 5.2 Hardware Revision

Revision 3 is the initially released version for the market.

### 5.3 Known Issues

No known issues.

## 6. Revision History

Doc. Rev.	Date	Comments
A	10/2017	Initial document release.

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