

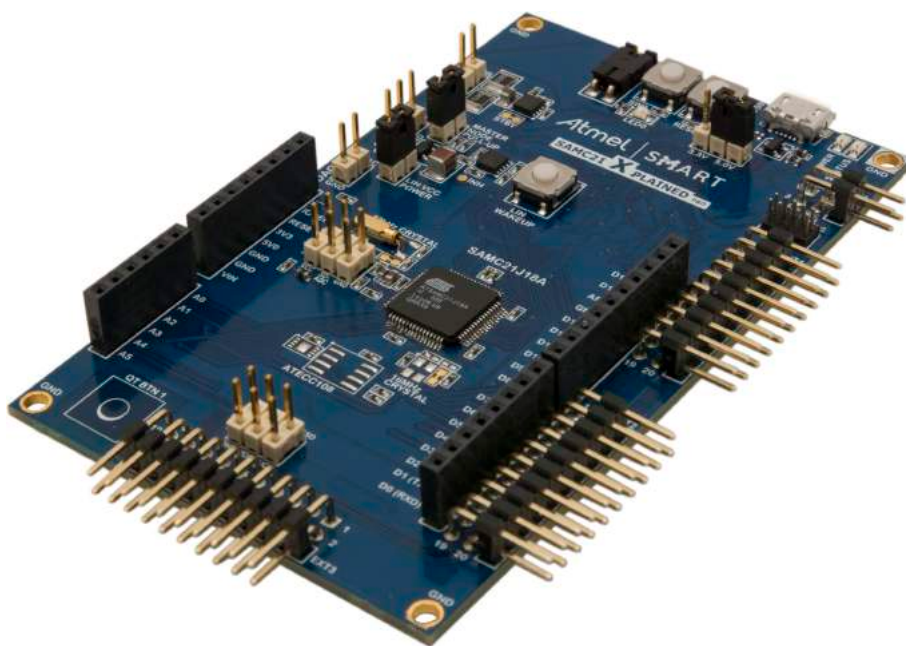
## Preface

The Atmel® SAM C21 Xplained Pro evaluation kit is a hardware platform to evaluate the Atmel ATSAMC21J18A microcontroller.

Supported by the Atmel Studio integrated development platform, the kit provides easy access to the features of the ATSAMC21J18A and explains how to integrate the device in a custom design.

The Xplained Pro MCU series evaluation kits include an on-board Embedded Debugger, and no external tools are necessary to program or debug the ATSAMC21J18A.

The Xplained Pro extension series evaluation kits offers additional peripherals to extend the features of the board and ease the development of custom designs.



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# 1. Introduction

## 1.1. Features

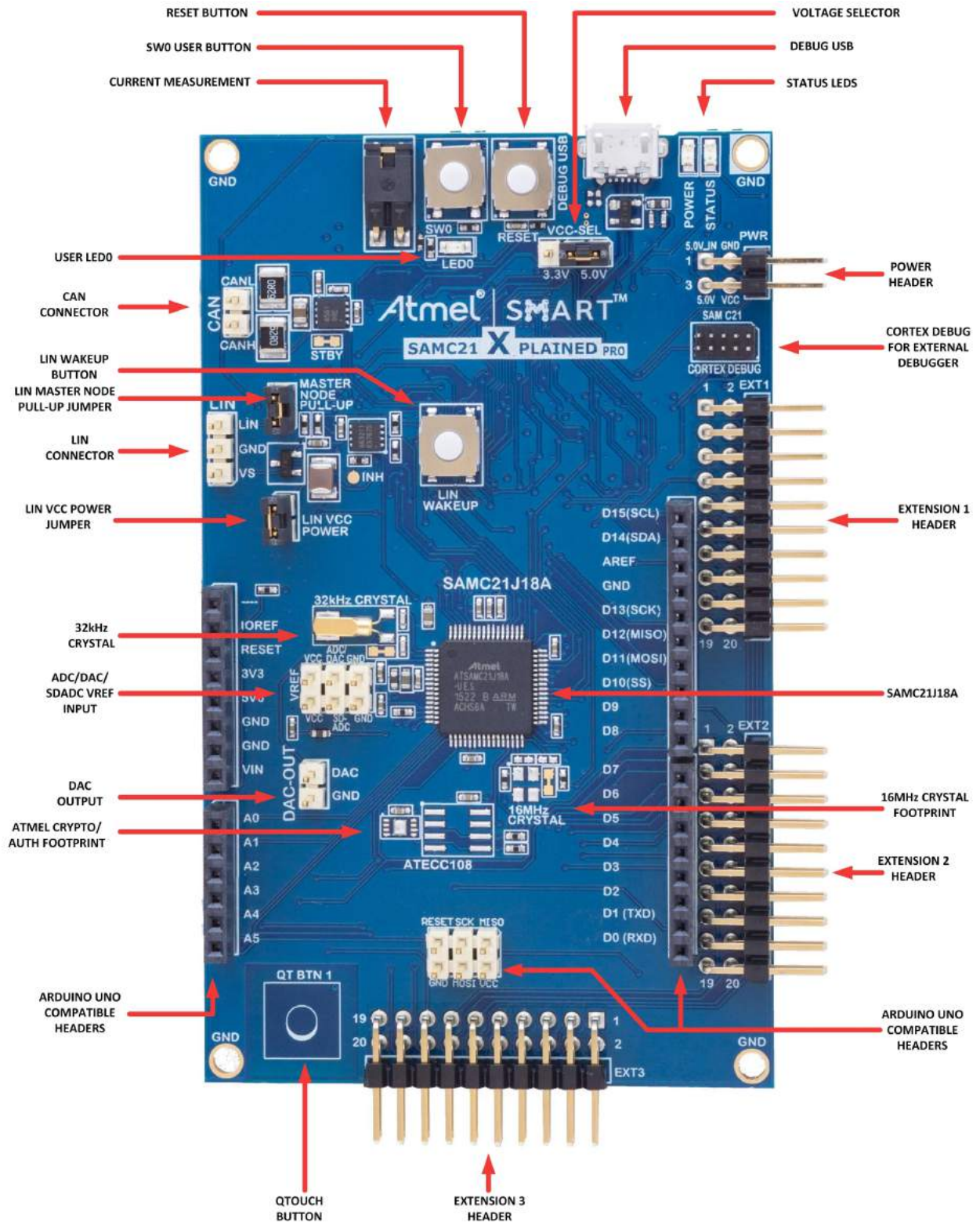
- ATSAMC21J18A microcontroller
- Embedded Debugger
  - USB interface
  - Auto-ID for board identification in Atmel Studio
  - One yellow status LED
  - One green board power LED
  - Symbolic debug of complex data types including scope information
  - Programming and debugging of on board SAM C21 through Serial Wire Debug (SWD)
  - Data Gateway Interface: SPI, I<sup>2</sup>C, four GPIOs
  - Virtual COM port (CDC)
  - Control of on-board power switch to protect connected extensions against high voltage
- Digital I/O
  - Two mechanical buttons (user and reset button)
  - One QTouch<sup>®</sup> button
  - One yellow user LED
  - Three Xplained Pro extension headers
- Two selectable target voltages
  - 3.3V
  - 5.0V
- Level converters between target section and EDBG section
- 32.768kHz crystal mounted
- 16MHz crystal footprint (not mounted)
- CAN transceiver
- LIN transceiver
  - Wake-up button
  - Master node pull-up enable
  - Alternate LIN power jumper
- DAC output connector
- Analog voltage reference connector with filtered power supply
  - SDADC VREF
  - ADC/DAC VREF
- Supported with application examples in Atmel Software Framework

## 1.2. Kit Overview

The Atmel SAM C21 Xplained Pro evaluation kit is a hardware platform to evaluate the Atmel ATSAMC21J18A.

The kit offers a set of features that enables the ATSAMC21J18A user to get started with the SAM C peripherals right away and to get an understanding of how to integrate the device in their own design.

Figure 1-1. SAM C21 Xplained Pro Evaluation Kit Overview



## 2. Getting Started

### 2.1. Xplained Pro Quick Start

Steps to start exploring the Atmel Xplained Pro platform:

1. Download [Atmel Studio](#).
2. Launch Atmel Studio.
3. Connect the DEBUG USB port on the kit to the PC using a USB cable (Standard-A to Micro-B or Micro-AB).

When the Xplained Pro MCU kit is connected to the computer for the first time, operating system will install the software driver. The driver file supports both 32- 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 green power LED will glow and Atmel Studio will auto detect the specific Xplained Pro MCU- and extension board(s) that are connected. Atmel Studio will present relevant information such as datasheets and kit documentation. The kit landing page in Atmel Studio also has an option to launch Atmel Software Framework (ASF) example applications for the kit. The SAM C21 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 SAM C21 Xplained Pro:

- [Xplained products](#) - Atmel Xplained evaluation kits are a series of easy-to-use evaluation kits for Atmel microcontrollers and other Atmel 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, they features 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 Atmel products.
- [Atmel Studio](#) - Free Atmel IDE for development of C/C++ and assembler code for Atmel microcontrollers.
- [Atmel sample store](#) - Atmel sample store where you can order samples of devices.
- [EDBG User Guide](#) - User guide containing 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 16KB for devices with M0, M0+, and M1 cores and 32KB for devices with other cores.
- [Atmel QTouch® Library PTC](#) - QTouch Library for Atmel AVR® and ARM®-based microcontrollers.
- [Atmel QTouch® Composer](#) - Tool for developing capacitive buttons, sliders, and wheels applications.
- [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.

- [Design Documentation](#) - Package containing CAD source, schematics, BOM, assembly drawings, 3D plots, layer plots etc.
- [Hardware Users Guide in PDF format](#) - PDF version of this User Guide.
- [SAM C21 Xplained Pro in the Atmel store](#) - Atmel Store link.

### 3. Xplained Pro

Xplained Pro is an evaluation platform that provides the full Atmel microcontroller experience. The platform consists of a series of Microcontroller (MCU) boards and extension boards, which are integrated with Atmel Studio, have Atmel Software Framework (ASF) drivers and demo code, support data streaming, and more. 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, datasheets, and example code through Atmel Studio.

#### 3.1. Embedded Debugger

The SAM C21 Xplained Pro contains the Atmel Embedded Debugger (EDBG) for on-board debugging. The EDBG is a composite USB device of three interfaces; a debugger, Virtual COM Port, and a Data Gateway Interface (DGI).

Together with Atmel Studio, the EDBG debugger interface can program and debug the ATSAMC21J18A. On SAM C21 Xplained Pro, the SWD interface is connected between the EDBG and the ATSAMC21J18A.

The Virtual COM Port is connected to a UART on the ATSAMC21J18A and provides an easy way to communicate with the target application through terminal software. It offers variable baud rate, parity, and stop bit settings. Note that the settings on the ATSAMC21J18A must match the settings given in the terminal software.



**Info:** The virtual COM port in the EDBG requires the terminal software to set the data terminal ready (DTR) signal to enable the UART pins connected to the ATSAMC21J18A. If the DTR signal is not enabled the UART pins on the EDBG is kept in high-z (tristate) rendering the COM port unusable. The DTR signal is set automatically by some terminal software, but it may have to be manually enabled in your terminal.

The DGI consists of several physical interfaces for communication with the host computer. Communication over the interfaces is bidirectional. It can be used to send events and values from the ATSAMC21J18A or as a generic printf-style data channel. Traffic over the interfaces can be timestamped on the EDBG for more accurate tracing of events. Note that timestamping imposes an overhead that reduces maximal throughput. [Atmel Data Visualizer](#) is used to send and receive data through DGI.

The EDBG controls two LEDs on SAM C21 Xplained Pro; a power LED and a status LED. The table below shows how the LEDs are controlled in different operation modes.

**Table 3-1. EDBG LED Control**

| Operation mode                     | Power LED                                                          | Status LED                                                                  |
|------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Normal operation                   | Power LED is lit when power is applied to the board.               | Activity indicator, LED flashes when any communication happens to the EDBG. |
| Bootloader mode (idle)             | The power LED and the status LED blinks simultaneously.            |                                                                             |
| Bootloader mode (firmware upgrade) | The power LED and the status LED blinks in an alternating pattern. |                                                                             |

For further documentation on the EDBG, see the [EDBG User Guide](#).

## 3.2. Hardware Identification System

All Xplained Pro compatible extension boards have an Atmel 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 Kits extension, installed with Atmel Studio, will give relevant information, code examples, and links to relevant documents. The table below 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 | 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                           |

## 3.3. Power Sources

The SAM C21 Xplained Pro kit can be powered by several power sources as listed in the table below.

**Table 3-3. Power Sources for SAM C21 Xplained Pro**

| Power input           | Voltage requirements                                                                                      | Current requirements                                                                                                                                                                                   | Connector marking |
|-----------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| External power        | 5V $\pm$ 2% ( $\pm$ 100mV) for USB host operation.<br>4.3V to 5.5V if USB host operation is not required. | Recommended minimum is 1A to be able to provide enough current for connected USB devices and the board itself.<br>Recommended maximum is 2A due to the input protection maximum current specification. | PWR               |
| Embedded debugger USB | 4.4V to 5.25V (according to USB spec.)                                                                    | 500mA (according to USB spec.)                                                                                                                                                                         | DEBUG USB         |

The kit will automatically detect which power sources are available and choose which one to use according to the following priority:

1. External power.

## 2. Embedded Debugger USB.



**Info:** External power is required when 500mA from a USB connector is not enough to power the board with possible extension boards.

## 3.4. Xplained Pro Headers and Connectors

### 3.4.1. Xplained Pro Standard Extension Header

All Xplained Pro kits have one or more dual row, 20-pin, 100mil extension header. Xplained Pro MCU boards have male headers, while Xplained Pro extensions have their female counterparts. Note that all pins are not always connected. All connected pins follow the defined pin-out description in the table below.

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.

**Table 3-4. Xplained Pro Standard Extension Header**

| Pin number | Name                 | Description                                                                  |
|------------|----------------------|------------------------------------------------------------------------------|
| 1          | ID                   | Communication line to the ID chip on an extension board                      |
| 2          | GND                  | Ground                                                                       |
| 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/<br>GPIO    | Slave select for SPI and/or general purpose I/O                              |
| 11         | I <sup>2</sup> C_SDA | Data line for I <sup>2</sup> C interface. Always implemented, bus type.      |
| 12         | I <sup>2</sup> C_SCL | Clock line for I <sup>2</sup> C interface. Always implemented, bus type.     |
| 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. Should preferably be unique.                           |

| Pin number | Name     | Description                                                                            |
|------------|----------|----------------------------------------------------------------------------------------|
| 16         | SPI_MOSI | Master out slave in line of serial peripheral interface. Always implemented, bus type. |
| 17         | SPI_MISO | Master in slave out line of serial peripheral interface. Always implemented, bus type. |
| 18         | SPI_SCK  | Clock for serial peripheral interface. Always implemented, bus type.                   |
| 19         | GND      | Ground                                                                                 |
| 20         | VCC      | Power for extension board                                                              |

### 3.4.2. Xplained Pro Power Header

The power header can be used to connect external power to the SAM C21 Xplained Pro kit. The kit will automatically detect and switch to any external power if supplied. The power header can also be used as supply for external peripherals or extension boards. Care must be taken not to exceed the total current limitation of the on-board regulator when using the 3.3V or 5.0V pin.

**Table 3-5. Xplained Pro Power Header**

| Pin number | Pin name      | Description                                                            |
|------------|---------------|------------------------------------------------------------------------|
| 1          | VEXT_P5V0     | External 5V input                                                      |
| 2          | GND           | Ground                                                                 |
| 3          | VCC_P5V0      | Unregulated 5V (output, derived from one of the input sources)         |
| 4          | VCC_P3V3_P5V0 | Regulated 3.3V or 5.0V (output, used as main power supply for the kit) |

## 4. Hardware Users Guide

### 4.1. Power Distribution

SAM C21 Xplained Pro has two power sources as described in [Power Sources](#). [Figure 4-1](#) shows a block diagram of the power supply circuitry. The kit can be powered from the EDBG USB and an external 5.0V source. The kit will automatically select which source to draw power from.

The EDBG controls an on-board power switch to the ATSAMC21J18A, the on-board peripherals, and extension connectors. When the kit is powered up, the EDBG reads the ID chip information from all connected Xplained Pro extension boards and checks that they are compatible with the voltage selected by the power selection jumper. If the selected voltage is within the connected extensions ranges the switch will open. If not, the EDBG power LED will blink rapidly and the switch will stay closed resulting in no power provided to the ATSAMC21J18A, on-board peripherals, and connectors.

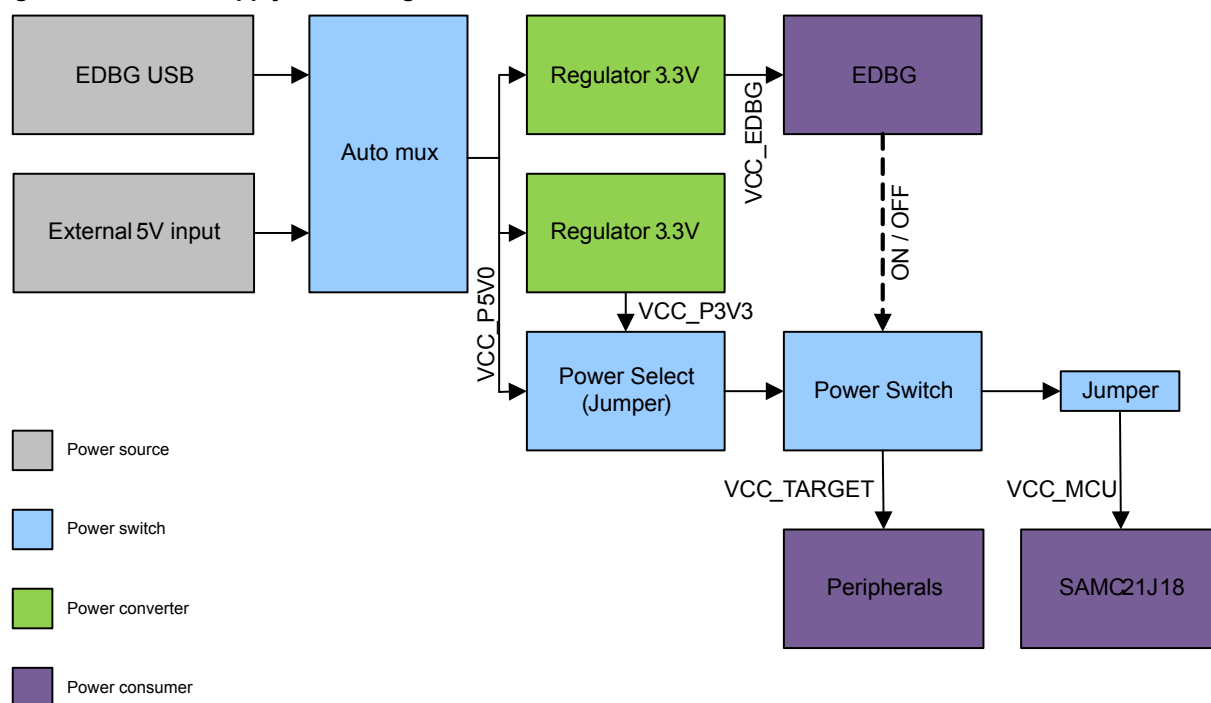


**Caution:** As the SAM C21 Xplained Pro can be powered by 5.0V care must be taken not to connect any Xplained Pro extensions that does not support this voltage, doing so may result in permanent damage. Check the respective extension kit's user guide to see which voltages are acceptable.



**Info:** The EDBG only reads the ID information and controls the power switch when the kit is powered up. This mechanism does not check hot-plugging of extension boards.

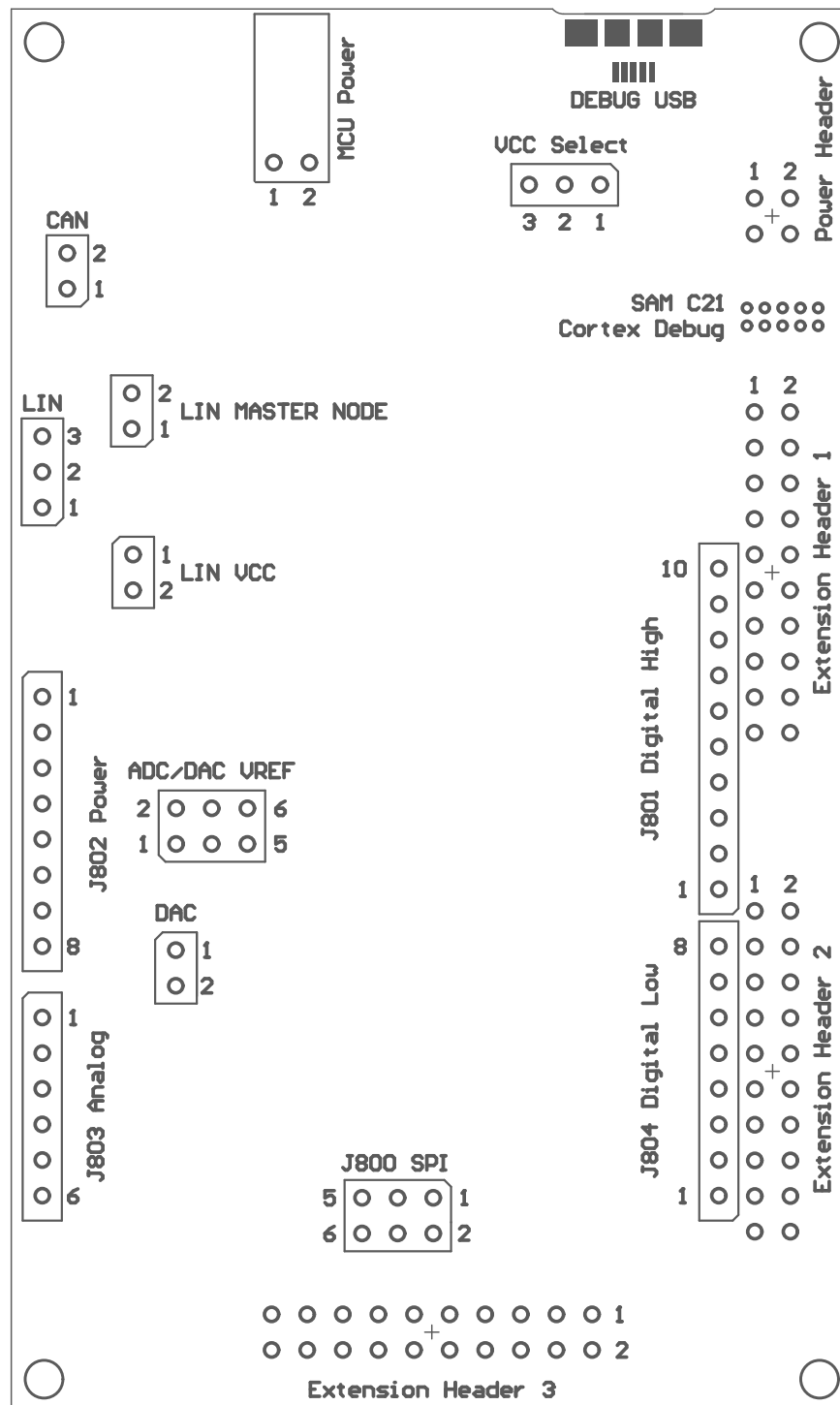
Figure 4-1. Power Supply Block Diagram



## 4.2. Connectors

The following sections describes the implementation of the relevant connectors and headers on SAM C21 Xplained Pro and their connection to the ATSAMC21J18A. The tables of connections in the sections also describes which signals are shared between the headers and on-board functionality. [Figure 4-2](#) shows all available connectors and jumpers on SAM C21 Xplained Pro.

**Figure 4-2. SAM C21 Xplained Pro Connector Overview**



#### 4.2.1. Xplained Pro Extension Headers

The SAM C21 Xplained Pro headers EXT1, EXT2, and EXT3 offers access to the I/O of the microcontroller in order to expand the board e.g. by connecting extensions to the board. These headers are based on the standard extension header specified in [Xplained Pro Standard Extension Header](#). The headers have a pitch of 2.54mm.

**Table 4-1. Extension Header EXT1**

| Pin on EXT1        | SAM C21 pin | Function                            | Shared functionality                                                                                                                           |
|--------------------|-------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 [ID]             | -           | -                                   | Communication line to the ID chip on an extension board.                                                                                       |
| 2 [GND]            | -           | -                                   | Ground.                                                                                                                                        |
| 3 [ADC(+)]         | PB09        | INP1                                | <a href="#">Shield</a>                                                                                                                         |
| 4 [ADC(-)]         | PB08        | INN1                                | <a href="#">Shield</a>                                                                                                                         |
| 5 [GPIO1]          | PA20        | GPIO                                | <a href="#">Shield</a>                                                                                                                         |
| 6 [GPIO2]          | PA21        | GPIO                                | <a href="#">Shield</a>                                                                                                                         |
| 7 [PWM(+)]         | PB12        | TC0/WO0                             | <a href="#">Shield</a> and <a href="#">EDBG GPIO0</a>                                                                                          |
| 8 [PWM(-)]         | PB13        | TC0/WO1                             | <a href="#">Shield</a>                                                                                                                         |
| 9 [IRQ/GPIO]       | PB14        | IRQ14/GPIO                          | -                                                                                                                                              |
| 10 [SPI_SS_B/GPIO] | PB15        | GPIO                                | -                                                                                                                                              |
| 11 [TWI_SDA]       | PA12        | SERCOM2 PAD[0] I <sup>2</sup> C SDA | <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , <a href="#">Crypto Device</a> , and <a href="#">EDBG I<sup>2</sup>C</a> |
| 12 [TWI_SCL]       | PA13        | SERCOM2 PAD[1] I <sup>2</sup> C SCL | <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , <a href="#">Crypto Device</a> , and <a href="#">EDBG I<sup>2</sup>C</a> |
| 13 [USART_RX]      | PA23        | SERCOM3 PAD[1] UART RX              | <a href="#">EXT2</a> , <a href="#">EXT3</a> , and <a href="#">Shield</a>                                                                       |
| 14 [USART_TX]      | PA22        | SERCOM3 PAD[0] UART TX              | <a href="#">EXT2</a> , <a href="#">EXT3</a> , and <a href="#">Shield</a>                                                                       |
| 15 [SPI_SS_A]      | PA17        | SERCOM1 PAD[1] SPI SS               | -                                                                                                                                              |
| 16 [SPI_MOSI]      | PA18        | SERCOM1 PAD[2] SPI MOSI             | -                                                                                                                                              |
| 17 [SPI_MISO]      | PA16        | SERCOM1 PAD[0] SPI MISO             | -                                                                                                                                              |
| 18 [SPI_SCK]       | PA19        | SERCOM1 PAD[3] SPI SCK              | -                                                                                                                                              |
| 19 [GND]           | -           | -                                   | Ground.                                                                                                                                        |
| 20 [VCC]           | -           | -                                   | Power for extension board.                                                                                                                     |

Table 4-2. Extension Header EXT2

| Pin on EXT2        | SAM C21 pin | Function                            | Shared functionality                                         |
|--------------------|-------------|-------------------------------------|--------------------------------------------------------------|
| 1 [ID]             | -           | -                                   | Communication line to the ID chip on an extension board.     |
| 2 [GND]            | -           | -                                   | Ground.                                                      |
| 3 [ADC(+)]         | PA08        | AIN10                               | Shield                                                       |
| 4 [ADC(-)]         | PA09        | AIN11                               | Shield                                                       |
| 5 [GPIO1]          | PA10        | GPIO                                | -                                                            |
| 6 [GPIO2]          | PA11        | GPIO                                | -                                                            |
| 7 [PWM(+)]         | PB30        | TCC0/WO0                            | Shield                                                       |
| 8 [PWM(-)]         | PB31        | TCC0/WO1                            | Shield                                                       |
| 9 [IRQ/GPIO]       | PB16        | IRQ0/GPIO                           | EDBG GPIO1                                                   |
| 10 [SPI_SS_B/GPIO] | PB17        | GPIO                                | EDBG GPIO2                                                   |
| 11 [TWI_SDA]       | PA12        | SERCOM2 PAD[0] I <sup>2</sup> C SDA | EXT1, EXT3, Shield, Crypto Device, and EDBG I <sup>2</sup> C |
| 12 [TWI_SCL]       | PA13        | SERCOM2 PAD[1] I <sup>2</sup> C SCL | EXT1, EXT3, Shield, Crypto Device, and EDBG I <sup>2</sup> C |
| 13 [USART_RX]      | PA23        | SERCOM3 PAD[1] UART RX              | EXT1, EXT3, and Shield                                       |
| 14 [USART_TX]      | PA22        | SERCOM3 PAD[0] UART TX              | EXT1, EXT3, and Shield                                       |
| 15 [SPI_SS_A]      | PB03        | SERCOM5 PAD[1] SPI SS               |                                                              |
| 16 [SPI_MOSI]      | PB00        | SERCOM5 PAD[2] SPI MOSI             | EXT3, Shield, Shield(2), and EDBG SPI                        |
| 17 [SPI_MISO]      | PB02        | SERCOM5 PAD[0] SPI MISO             | EXT3, Shield, Shield(2), and EDBG SPI                        |
| 18 [SPI_SCK]       | PB01        | SERCOM5 PAD[3] SPI SCK              | EXT3, Shield, Shield(2), and EDBG SPI                        |
| 19 [GND]           | -           | -                                   | Ground.                                                      |
| 20 [VCC]           | -           | -                                   | Power for extension board.                                   |

**Table 4-3. Extension Header EXT3**

| Pin on EXT3        | SAM C21 pin | Function                            | Shared functionality                                         |
|--------------------|-------------|-------------------------------------|--------------------------------------------------------------|
| 1 [ID]             | -           | -                                   | Communication line to the ID chip on an extension board.     |
| 2 [GND]            | -           | -                                   | Ground.                                                      |
| 3 [ADC(+)]         | PB07        | AIN9/INP2                           | Shield                                                       |
| 4 [ADC(-)]         | PB06        | AIN8/INN2                           | Shield                                                       |
| 5 [GPIO1]          | PB04        | GPIO                                | Shield                                                       |
| 6 [GPIO2]          | PB05        | GPIO                                | Shield                                                       |
| 7 [PWM(+)]         | PA14        | TC4/WO0                             | Crystal footprint                                            |
| 8 [PWM(-)]         | PA15        | TC4/WO1                             | User LED and Crystal footprint                               |
| 9 [IRQ/GPIO]       | PA28        | IRQ8/GPIO                           | User Button and EDBG GPIO3                                   |
| 10 [SPI_SS_B/GPIO] | PA27        | GPIO                                | Shield                                                       |
| 11 [TWI_SDA]       | PA12        | SERCOM2 PAD[0] I <sup>2</sup> C SDA | EXT1, EXT2, Shield, Crypto Device, and EDBG I <sup>2</sup> C |
| 12 [TWI_SCL]       | PA13        | SERCOM2 PAD[1] I <sup>2</sup> C SCL | EXT1, EXT2, Shield, Crypto Device, and EDBG I <sup>2</sup> C |
| 13 [USART_RX]      | PA23        | SERCOM3 PAD[1] UART RX              | EXT1, EXT2, and Shield                                       |
| 14 [USART_TX]      | PA22        | SERCOM3 PAD[0] UART TX              | EXT1, EXT2, and Shield                                       |
| 15 [SPI_SS_A]      | PA02        | GPIO                                | DAC Header                                                   |
| 16 [SPI_MOSI]      | PB00        | SERCOM5 PAD[2] SPI MOSI             | EXT2, Shield, Shield(2), and EDBG SPI                        |
| 17 [SPI_MISO]      | PB02        | SERCOM5 PAD[0] SPI MISO             | EXT2, Shield, Shield(2), and EDBG SPI                        |
| 18 [SPI_SCK]       | PB01        | SERCOM5 PAD[3] SPI SCK              | EXT2, Shield, Shield(2), and EDBG SPI                        |
| 19 [GND]           | -           | -                                   | Ground.                                                      |
| 20 [VCC]           | -           | -                                   | Power for extension board.                                   |

#### 4.2.2. Arduino Connectors

SAM C21 Xplained Pro implements Arduino shield connectors based on the [Arduino Uno](#). All references to Arduino pin names are taken from the official Arduino [schematics](#) of the Arduino Uno.



**Caution:** The target section of SAM C21 Xplained Pro can be powered by 3.3V or 5.0V. The maximum voltage the I/O pins can tolerate depends on the supply voltage. Providing higher voltages like 5V to an I/O pin when the ATSAMC21J18A is powered by 3.3V could damage the board.



**Info:** Note that all pins do not have the exact same functionality as on the Arduino Uno on the shield connectors. Each shield should be checked for compatibility before it is connected.

**Table 4-4. J802 - Power**

| Pin on J802 | SAM C21 pin | Arduino pin name | Function             | Shared functionality |
|-------------|-------------|------------------|----------------------|----------------------|
| 1           | -           | RFU              | -                    | -                    |
| 2           | -           | IOREF            | VCC_TARGET_P3V3_P5V0 | -                    |
| 3           | RESETN      | RESET            | TARGET_RESET         | -                    |
| 4           | -           | 3.3V             | VCC_P3V3             | -                    |
| 5           | -           | 5V               | VCC_P5V0             | -                    |
| 6           | -           | GND              | GND                  | -                    |
| 7           | -           | GND              | GND                  | -                    |
| 8           | -           | VIN              | VCC_EXT_P5V0         | -                    |

**Table 4-5. J803 - Analog**

| Pin on J803 | SAM C21 pin | Arduino pin name | Function    | Shared functionality |
|-------------|-------------|------------------|-------------|----------------------|
| 1           | PB09        | ADC0             | INP1        | <a href="#">EXT1</a> |
| 2           | PB08        | ADC1             | INN1        | <a href="#">EXT1</a> |
| 3           | PA08        | ADC2             | AIN10       | <a href="#">EXT2</a> |
| 4           | PA09        | ADC3             | AIN11       | <a href="#">EXT2</a> |
| 5           | PB07        | ADC4             | AIN9 / INP2 | <a href="#">EXT3</a> |
| 6           | PB06        | ADC5             | AIN8 / INN2 | <a href="#">EXT3</a> |

**Table 4-6. J804 - Digital Low**

| Pin on J804 | SAM C21 pin | Arduino pin name | Function             | Shared functionality                                                   |
|-------------|-------------|------------------|----------------------|------------------------------------------------------------------------|
| 1           | PA23        | D0 / RX0         | SERCOM3 PAD1 UART RX | <a href="#">EXT1</a> , <a href="#">EXT2</a> , and <a href="#">EXT3</a> |
| 2           | PA22        | D1 / TX0         | SERCOM3 PAD0 UART TX | <a href="#">EXT1</a> , <a href="#">EXT2</a> , and <a href="#">EXT3</a> |
| 3           | PA20        | D2               | GPIO                 | <a href="#">EXT1</a>                                                   |
| 4           | PB12        | D3               | TC0_W0               | <a href="#">EXT1</a> and <a href="#">EDBG GPIO</a>                     |
| 5           | PA21        | D4               | GPIO                 | <a href="#">EXT1</a>                                                   |
| 6           | PB13        | D5               | TC0_W1               | <a href="#">EXT1</a>                                                   |

| Pin on J804 | SAM C21 pin | Arduino pin name | Function | Shared functionality |
|-------------|-------------|------------------|----------|----------------------|
| 7           | PB30        | D6               | TCC0_W0  | EXT2                 |
| 8           | PB04        | D7               | GPIO     | EXT3                 |

**Table 4-7. J801 - Digital High**

| Pin on J801 | SAM C21 pin | Arduino pin name | Function        | Shared functionality                   |
|-------------|-------------|------------------|-----------------|----------------------------------------|
| 1           | PB05        | D8               | GPIO            | EXT3                                   |
| 2           | PB31        | D9               | TCC0_W1         | EXT2                                   |
| 3           | PA27        | D10 / SPI-SS     | GPIO            | EXT3                                   |
| 4           | PB00        | D11 / SPI-MOSI   | SERCOM5 PAD2    | EXT2, EXT3, EDBG SPI, and Shield       |
| 5           | PB02        | D12 / SPI-MISO   | SERCOM5 PAD0    | EXT2, EXT3, EDBG SPI, and Shield       |
| 6           | PB01        | D13 / SPI-SCK    | SERCOM5 PAD3    | EXT2, EXT3, EDBG SPI, and Shield       |
| 7           | -           | GND              | -               | -                                      |
| 8           | PA03        | AREF             | ADC / DAC VREFA |                                        |
| 9           | PA12        | SDA              | SERCOM2 PAD0    | EXT1, EXT2, EXT3, Crypto, and EDBG I2C |
| 10          | PA13        | SCL              | SERCOM2 PAD1    | EXT1, EXT2, EXT3, Crypto, and EDBG I2C |

**Table 4-8. J800 - SPI**

| Pin on J800 | SAM C21 pin | Arduino pin name | Function             | Shared functionality             |
|-------------|-------------|------------------|----------------------|----------------------------------|
| 1           | PB02        | MISO             | SERCOM5 PAD0         | EXT2, EXT3, EDBG SPI, and Shield |
| 2           | -           | <b>5V</b>        | VCC_TARGET_P3V3_P5V0 | -                                |
| 3           | PB01        | SCK              | SERCOM5 PAD3         | EXT2, EXT3, EDBG SPI, and Shield |
| 4           | PB00        | MOSI             | SERCOM5 PAD2         | EXT2, EXT3, EDBG SPI, and Shield |
| 5           | RESETN      | RESET            | TARGET_RESET         | -                                |
| 6           | -           | GND              | GND                  | -                                |

#### 4.2.3. VCC Selection Header

The SAM C21 Xplained Pro has a 3-pin header labeled VCC\_SEL on the board. This header can be used to select between 3.3V and 5.0V as the supply voltage for the ATSAMC21J18A, peripherals, and extension headers by placing a jumper on pin 1-2 or pin 2-3. Selecting 5.0V will supply the kit directly from the USB or an external 5.0V source. Selecting 3.3V will supply the kit from an on-board regulator.

**Table 4-9. VCC\_SEL Header**

| VCC_SEL header pin | Function   |
|--------------------|------------|
| 1                  | VCC_P5V0   |
| 2                  | VCC_TARGET |
| 3                  | VCC_P3V3   |

#### 4.2.4. VREF Header

SAM C21 Xplained Pro has a 6-pin header labeled VREF on the board. This header can be used to select / apply a voltage reference to the ADC, DAC, and SDADC. Jumpers can be used to tie SADC VREF and ADC/DAC VREF to the kit target voltage from pin 1-3 and 2-4, or external voltages can be applied across pin 3-5 and 4-6.

**Table 4-10. VREF Header**

| VREF header pin | Pin / Net          | Function                    |
|-----------------|--------------------|-----------------------------|
| 1               | VCC_AREF_P3V3_P5V0 | Filtered kit target voltage |
| 2               | VCC_AREF_P3V3_P5V0 | Filtered kit target voltage |
| 3               | PA04               | SDADC voltage reference     |
| 4               | PA03               | ADC / DAC voltage reference |
| 5               | GND                | Ground                      |
| 6               | GND                | Ground                      |

#### 4.2.5. DAC Header

SAM C21 Xplained Pro has a 2-pin header labeled DAC-OUT on the board that is connected to the DAC output of the ATSAMC21J18A and ground.

**Table 4-11. DAC Header**

| DAC header pin | Pin / Net | Function    | Shared functionality |
|----------------|-----------|-------------|----------------------|
| 1              | PA02      | DAC0 output | <a href="#">EXT3</a> |
| 2              | GND       | Ground      |                      |

#### 4.2.6. Current Measurement Header

An angled 1x2, 100mil pin-header marked with MCU current measurement is located at the upper edge of the SAM C21 Xplained Pro. All power to the ATSAMC21J18A is routed through this header. To measure the power consumption of the device remove the jumper and replace it with an ammeter.



**Caution:** Removing the jumper from the pin-header while the kit is powered may cause the ATSAMC21J18A to be powered through its I/O pins. This may cause permanent damage to the device.

#### 4.2.7. Cortex Debug Connector

SAM C21 Xplained Pro has a 10-pin 50-mil Cortex® Debug Connector that can be used to attach external debuggers to the ATSAMC21J18A.

**Table 4-12. Cortex Debug Connector**

| Cortex Debug Connector pin | Pin / Net            | Function             |
|----------------------------|----------------------|----------------------|
| 1                          | VCC_TARGET_P3V3_P5V0 | ATSAMC21J18A voltage |
| 2                          | SWDIO                | SWD data signal      |
| 3                          | GND                  | Ground               |
| 4                          | SWCLK                | SWD clock signal     |
| 5                          | GND                  | Ground               |
| 6                          | -                    | -                    |
| 7                          | -                    | -                    |
| 8                          | -                    | -                    |
| 9                          | GND                  | Ground               |
| 10                         | RESETN               | Target reset signal  |

## 4.3. Peripherals

### 4.3.1. LED

There is one yellow LED available on the SAM C21 Xplained Pro board that can be turned on and off. The LED is activated by driving the connected I/O line to low.

**Table 4-13. LED Connection**

| SAM C21 pin | Function    | Shared functionality                                       |
|-------------|-------------|------------------------------------------------------------|
| PA15        | Yellow LED0 | <a href="#">Crystal footprint</a> and <a href="#">EXT3</a> |

### 4.3.2. Mechanical Buttons

SAM C21 Xplained Pro contains two mechanical buttons connected to the SAM C21. One button is the RESET button connected to the reset line and the other is a generic user configurable button. When a button is pressed it will drive the I/O line to GND.



**Info:** There is no pull-up resistor connected to the generic user button. Remember to enable the internal pull-up in the SAM C21 to use the button.

**Table 4-14. Mechanical Buttons**

| SAM C21 pin | Function | Shared functionality                                                          |
|-------------|----------|-------------------------------------------------------------------------------|
| RESETN      | RESET    | <a href="#">Shield</a> , <a href="#">Shield(2)</a> , and <a href="#">EDBG</a> |
| PA28        | SW0      | <a href="#">EXT3</a> and <a href="#">EDBG GPIO3</a>                           |

### 4.3.3. Crystals

The SAM C21 Xplained Pro kit contains one mounted 32.768kHz crystal and a footprint for higher frequency crystals that can be used as clock sources for the SAM C21. The crystals have cut-straps next to them that can be used to measure the oscillator safety factor. This is done by cutting the strap and

adding a resistor across the strap. Information about oscillator allowance and safety factor can be found in appnote [AVR4100](#). Information about clock calibration and compensation can be found in appnote [AT03155](#).

The footprint for the external crystal is based on the Epson® TSX-3225 series.

**Table 4-15. External 32.768kHz Crystal**

| SAM C21 pin | Function | Shared functionality |
|-------------|----------|----------------------|
| PA00        | XIN32    | -                    |
| PA01        | XOUT32   | -                    |

**Table 4-16. External Crystal Footprint**

| SAM C21 pin | Function | Shared functionality                              |
|-------------|----------|---------------------------------------------------|
| PA14        | XIN      | <a href="#">EXT3</a>                              |
| PA15        | XOUT     | <a href="#">EXT3</a> and <a href="#">User LED</a> |

#### 4.3.4. CAN

ATSAMC21J18A has two CAN modules that performs communication according to ISO11898-1 (Bosch CAN specification 2.0 part A,B) and Bosch CAN FD specification V1.0.

CAN0 is connected to an on-board [ATA6561](#) CAN physical-layer transceiver. [Table 4-17](#) shows connections between the ATSAMC21J18A and the ATA6561.

The CAN differential signals are connected to a 1 x 2, 100 mil pin-header labeled CAN.

**Table 4-17. ATA6561 Connections**

| SAM C21pin | Function | ATA6561 function | Shared functionality |
|------------|----------|------------------|----------------------|
| PA24       | CAN0TX   | TXD              | -                    |
| PA25       | CAN0RX   | RXD              | -                    |

**Table 4-18. CAN Header**

| CAN header pin | Function |
|----------------|----------|
| 1              | CANH     |
| 2              | CANL     |

#### 4.3.5. LIN

An ATA663211 LIN transceiver is mounted on the kit to convert the LIN signals from the SERCOM module in the SAM C21 device. The LIN compatible signals are available at a 3-pin header.

Table 4-19. LIN Transceiver

| SAM C21 pin | Function              | ATA663211 function | Shared functionality |
|-------------|-----------------------|--------------------|----------------------|
| PA06        | SERCOM0 PAD[2] LIN TX | LIN TXD            | -                    |
| PA07        | SERCOM0 PAD[3] LIN RX | LIN RXD            | -                    |
| PB22        | GPIO                  | LIN EN             | -                    |

Table 4-20. LIN Header

| LIN header pin | Function |
|----------------|----------|
| 1              | VS       |
| 2              | GND      |
| 3              | LIN      |

Table 4-21. Master Node Pull-up Enable Header

| LIN header pin | Function          |
|----------------|-------------------|
| 1              | LIN               |
| 2              | 1kΩ pull-up to VS |

Table 4-22. LIN VCC Power

| LIN header pin | Function             |
|----------------|----------------------|
| 1              | VS                   |
| 2              | VCC_TARGET_P3V3_P5V0 |

#### 4.3.6. QTouch Button

There is one self capacitance button available on the SAM C21 Xplained Pro board that can be used as I/O. This QTouch button is intended to be driven by the built-in Peripheral Touch Controller (PTC) of the device.

**Note:** To get started with QTouch, refer to [Atmel QTouch® Library](#) and [Atmel QTouch® Composer](#).

Table 4-23. QTouch Connection

| SAM C21 pin | Silkscreen text |
|-------------|-----------------|
| PA05        | QT BTN1         |

#### 4.3.7. Crypto Footprints

Several of the Atmel security devices, including CryptoAuthentication devices like the [ATECC108A](#), requires only an I<sup>2</sup>C interface to work, and they share the same packages and pinouts. SAM C21 Xplained Pro has implemented SOIC8 and UDFN8 footprints for these devices so the user may solder them on themselves. [Table 4-24](#) shows all the connections between the footprints and the ATSAMC21J18A.

**Table 4-24. Crypto Footprints**

| Pin on footprint | SAM C21 pin | Function                    | Shared functionality                                |
|------------------|-------------|-----------------------------|-----------------------------------------------------|
| 1                | -           | NC                          | -                                                   |
| 2                | -           | NC                          | -                                                   |
| 3                | -           | NC                          | -                                                   |
| 4                | -           | GND                         | -                                                   |
| 5                | PA12 [SDA]  | I <sup>2</sup> C data line  | EXT1, EXT2, EXT3, Shield, and EDBG I <sup>2</sup> C |
| 6                | PA13 [SCL]  | I <sup>2</sup> C clock line | EXT1, EXT2, EXT3, Shield, and EDBG I <sup>2</sup> C |
| 7                | -           | NC                          | -                                                   |
| 8                | -           | VCC_TARGET_P3V3             | -                                                   |
| PADDLE           | -           | GND                         | -                                                   |

#### 4.4. Kit Modifications

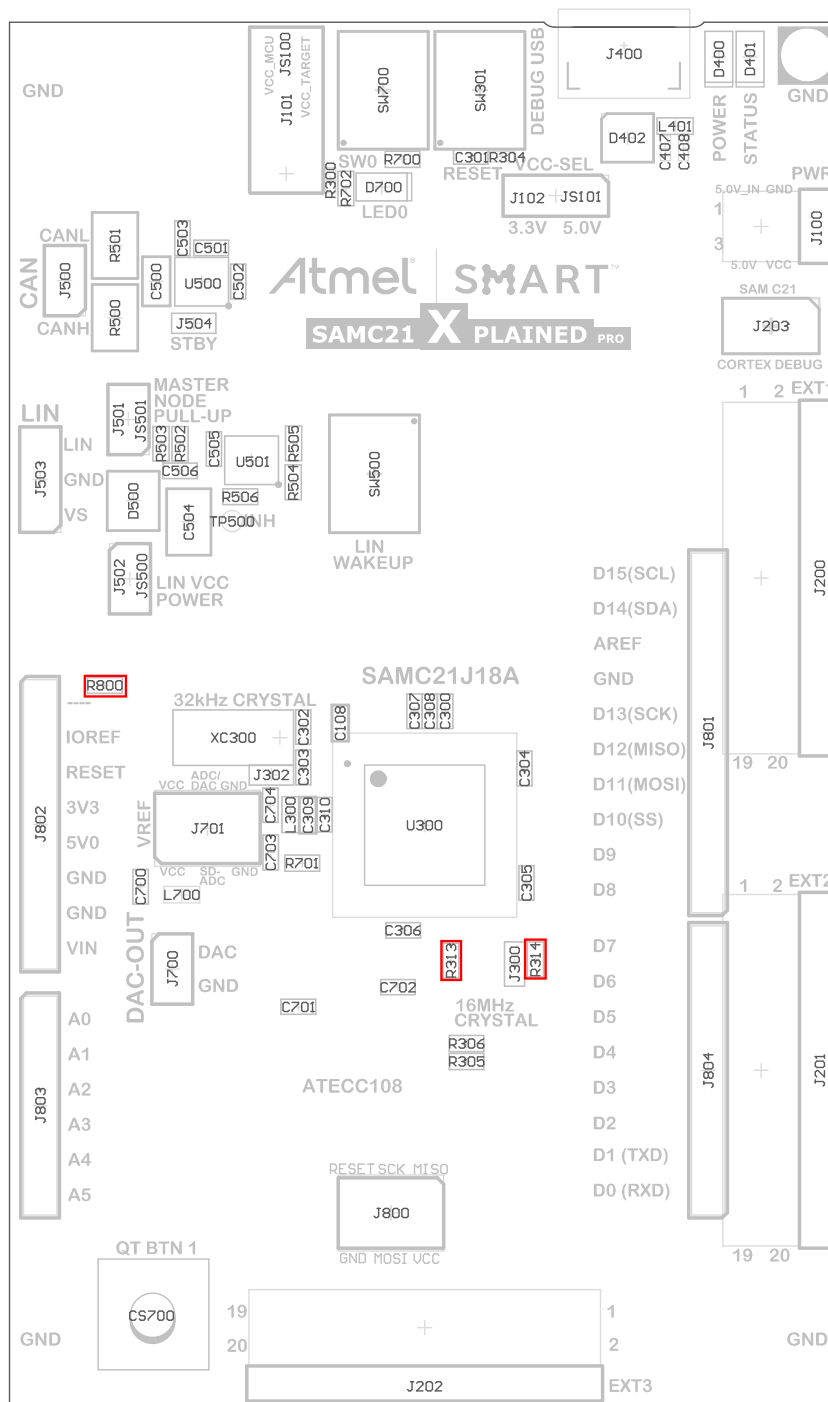
SAM C21 Xplained Pro has several resistors and jumpers that can be removed/cut to disconnect I/O pins of the ATSAMC21J18A from connectors and on-board ICs and to disconnect/measure power to different sections.

**Table 4-25. Resistors**

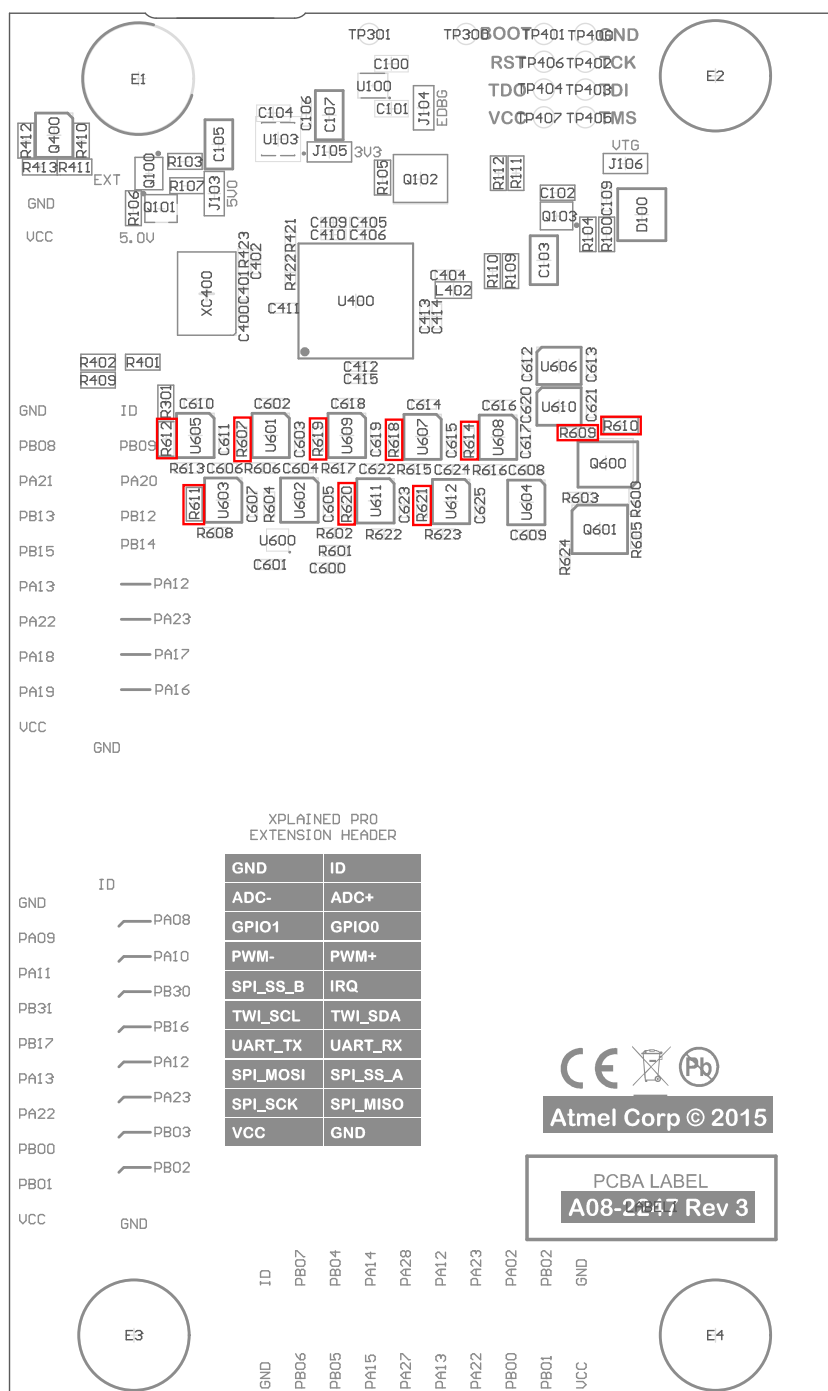
| Designator | From   | To                 | Comment                                                   |
|------------|--------|--------------------|-----------------------------------------------------------|
| R313       | PA14   | EXT3 pin 7         | Remove when using external crystal                        |
| R314       | PA15   | EXT3 pin 8 and LED |                                                           |
| R609       | RESETN | RESET NET          | Remove to disconnect the RESETN pin from the reset system |

| Designator | From       | To                   | Comment                                                                  |
|------------|------------|----------------------|--------------------------------------------------------------------------|
| R607       | PB11 RX    | CDC RX               | Remove to disconnect pins from the EDBG level shifters                   |
| R610       | RESET NET  | EDBG RESET           |                                                                          |
| R611       | PA31 SWDIO | EDBG SWDIO           |                                                                          |
| R612       | PA30 SWCLK | EDBG SWCLK           |                                                                          |
| R614       | PB02 MISO  | EDBG MISO            |                                                                          |
| R618       | PB12       | EDBG GPIO0           |                                                                          |
| R619       | PB16       | EDBG GPIO1           |                                                                          |
| R620       | PB17       | EDBG GPIO2           |                                                                          |
| R621       | PA28       | EDBG GPIO3           |                                                                          |
| R800       | RESETN     | Arduino shield RESET | Remove to disconnect the reset system from the Arduino shield connectors |

### Figure 4-3. Resistors Top



**Figure 4-4. Resistors Bottom**



**Table 4-26. Jumpers**

| Designator | From                                                     | To                             | Comment                                                                                                                     |
|------------|----------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| J101       | VCC_TARGET_X_P3V3_P5V0                                   | VCC_TARGET_P3V3_P5V0           | Remove this jumper (JS100) to measure current to the MCU section                                                            |
| J102       | VCC_IN_P5V0 (pin 1) and VCC_P3V3_TARGET (pin 3)          | VCC_TARGET_SWITC H_P3V3_P5V0   | Use this jumper (JS101) to select either 5.0V or 3.3V voltage to the Target section. Default setting in production is 5.0V. |
| J103       | VCC_IN_P5V0                                              | VCC_P5V0                       | Cut this jumper to measure current from the 5.0V input MUX section. The footprint is 0603 sized.                            |
| J104       | 3.3V linear regulator output for EDBG section            | VCC_EDBG_P3V3                  | Cut this jumper to measure current to the EDBG section. The footprint is 0603 sized.                                        |
| J105       | 3.3V linear regulator output for Target and MCU sections | VCC_P3V3                       | Cut this jumper to measure current to the Target and MCU sections. The footprint is 0603 sized.                             |
| J106       | VCC_TARGET_X_P3V3_P5V0                                   | VCC_TARGET_P3V3_P5V0           | Cut this jumper to measure current to the Target section. The footprint is 0603 sized.                                      |
| J300       | PA15_XOUT                                                | 16MHz crystal pin              | Cut this jumper and mount resistors to find 16MHz crystal oscillator safety factor. The footprint is 0603 sized.            |
| J501       | LIN signal                                               | Pull-up resistor to VS voltage | Mount this jumper (JS501) to set the LIN transceiver as Master node. Default setting in production is mounted.              |

| Designator | From                    | To                   | Comment                                                                                                                                                                                              |
|------------|-------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| J502       | VS_LIN                  | VCC_TARGET_P3V3_P5V0 | Mount this jumper (JS500) to power the LIN transceiver from VCC_TARGET_P3V3_P5V0. Remove this jumper when the LIN transceiver is powered from the LIN bus. Default setting in production is mounted. |
| J504       | CAN device, Standby pin | GND                  | Cut this jumper to explore the standby functionality of the CAN transceiver (ATA6561). The footprint is 0603 sized.                                                                                  |

Figure 4-5. Jumpers Top

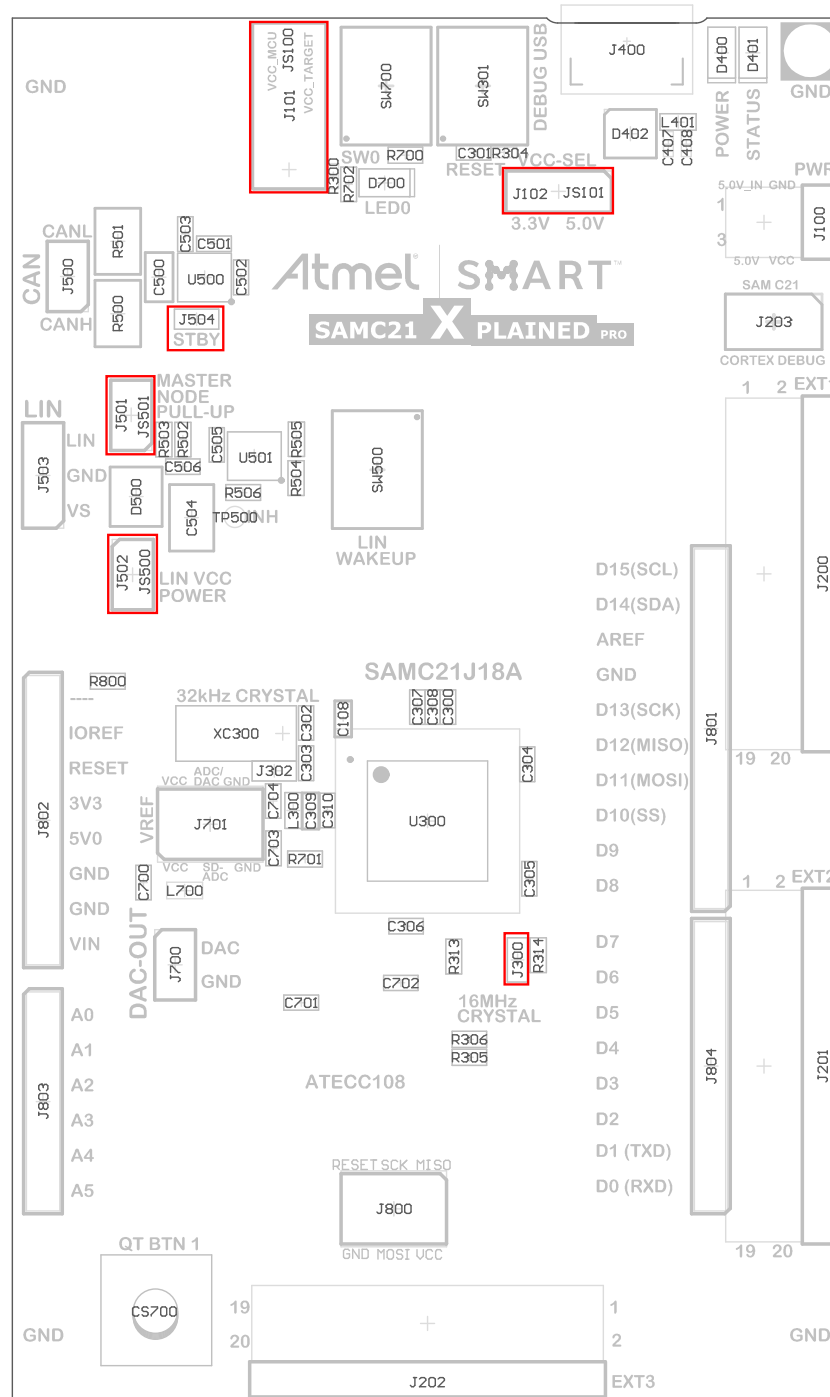
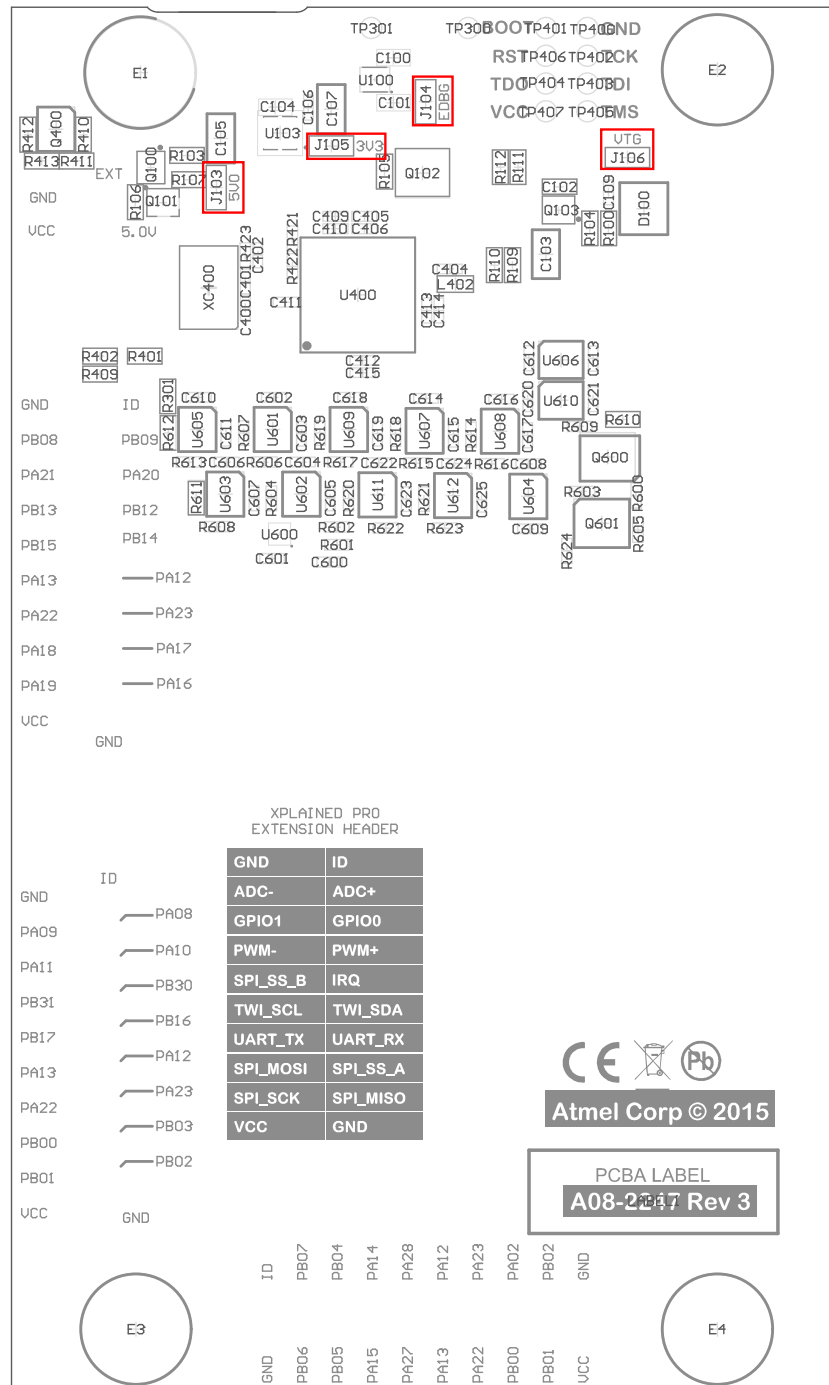


Figure 4-6. Jumpers Bottom



## 4.5. Embedded Debugger Implementation

SAM C21 Xplained Pro contains an Embedded Debugger (EDBG) that can be used to program and debug the ATSAMC21J18A using Serial Wire Debug (SWD). The Embedded Debugger also include a Virtual Com port interface over UART, an Atmel Data Gateway Interface over SPI, and TWI and it includes four of the SAM C21 GPIOs. Atmel Studio can be used as a front end for the Embedded Debugger.

#### 4.5.1. Serial Wire Debug

The Serial Wire Debug (SWD) use two pins to communicate with the target. For further information on how to use the programming and debugging capabilities of the EDBG, see [Embedded Debugger](#).

**Table 4-27. SWD Connections**

| SAM C21 pin | Function  |
|-------------|-----------|
| PA30        | SWD clock |
| PA31        | SWD data  |

#### 4.5.2. Virtual COM Port

The Embedded Debugger acts as a Virtual Com Port gateway by using one of the ATSAMC21J18A UARTs. For further information on how to use the Virtual COM port, see [Embedded Debugger](#).

**Table 4-28. Virtual COM Port Connections**

| SAM C21 pin | Function                                  | Shared functionality |
|-------------|-------------------------------------------|----------------------|
| PB10        | SERCOM4 PAD[2] UART TXD (SAM C21 TX line) | -                    |
| PB11        | SERCOM4 PAD[3] UART RXD (SAM C21 RX line) | -                    |

#### 4.5.3. Atmel Data Gateway Interface

The Embedded Debugger features an Atmel Data Gateway Interface (DGI) by using either an SPI or I<sup>2</sup>C. The DGI can be used to send a variety of data from the ATSAMC21J18A to the host PC. For further information on how to use the DGI interface, see [Atmel Data Visualizer](#) and the [EDBG User Guide](#).

**Table 4-29. DGI Interface Connections when using SPI**

| SAM C21 pin | Function                                       | Shared functionality                                                                                 |
|-------------|------------------------------------------------|------------------------------------------------------------------------------------------------------|
| PB23        | GPIO/SPI SS (Slave select) (SAM C21 is Master) | -                                                                                                    |
| PB02        | SERCOM5 PAD[0] SPI MISO (Master In, Slave Out) | <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , and <a href="#">Shield(2)</a> |
| PB00        | SERCOM5 PAD[2] SPI MOSI (Master Out, Slave In) | <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , and <a href="#">Shield(2)</a> |
| PB01        | SERCOM5 PAD[3] SPI SCK (Clock Out)             | <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , and <a href="#">Shield(2)</a> |

**Table 4-30. DGI Interface Connections when using I<sup>2</sup>C**

| SAM C21 pin | Function                        | Shared functionality                                                                                                                |
|-------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| PA12        | SERCOM2 PAD[0] SDA (Data line)  | <a href="#">EXT1</a> , <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , and <a href="#">Crypto Footprints</a> |
| PA13        | SERCOM2 PAD[1] SCL (Clock line) | <a href="#">EXT1</a> , <a href="#">EXT2</a> , <a href="#">EXT3</a> , <a href="#">Shield</a> , and <a href="#">Crypto Footprints</a> |

Four GPIO lines are connected to the Embedded Debugger. The EDBG can monitor these lines and time stamp pin value changes. This makes it possible to accurately time stamp events in the SAM C21

application code. For further information on how to configure and use the GPIO monitoring features, see [Atmel Data Visualizer](#) and the [EDBG User Guide](#).

**Table 4-31. GPIO Lines Connected to the EDBG**

| SAM C21 pin | Function | Shared functionality                                 |
|-------------|----------|------------------------------------------------------|
| PB12        | GPIO0    | <a href="#">Shield</a> and <a href="#">EXT1</a>      |
| PB16        | GPIO1    | <a href="#">EXT2</a>                                 |
| PB17        | GPIO2    | <a href="#">EXT2</a>                                 |
| PA28        | GPIO3    | <a href="#">User Button</a> and <a href="#">EXT3</a> |

## 5. Appendix

### 5.1. Getting Started with IAR

IAR Embedded Workbench® for ARM® is a proprietary high efficiency compiler not based on GCC. Programming and debugging of Xplained Pro kits are supported in IAR™ Embedded Workbench for ARM using the common CMSIS-DAP interface. Some initial settings have to be set up in the project to get the programming and debugging to work.

The following steps will explain how to get your project ready for programming and debugging:

1. Make sure you have opened the project you want to configure. Open the **OPTIONS** dialog for the project.
2. In the category **General Options**, select the **Target** tab. [Select the device for the project or, if not listed, the core of the device.](#)
3. In the category **Debugger**, select the **Setup** tab. [Select \*\*CMSIS DAP\*\* as the driver.](#)
4. In the category **Debugger**, select the **Download** tab. [Check the check box for \*\*Use flash loader\(s\)\*\* option.](#)
5. In the category **Debugger > CMSIS DAP**, select the **Setup** tab. [Select \*\*System \(default\)\*\* as the reset method.](#)
6. In the category **Debugger > CMSIS DAP**, select the **JTAG/SWD** tab. [Select \*\*SWD\*\* as the interface and optionally select the \*\*SWD speed\*\*.](#)

Figure 5-1. Select Target Device

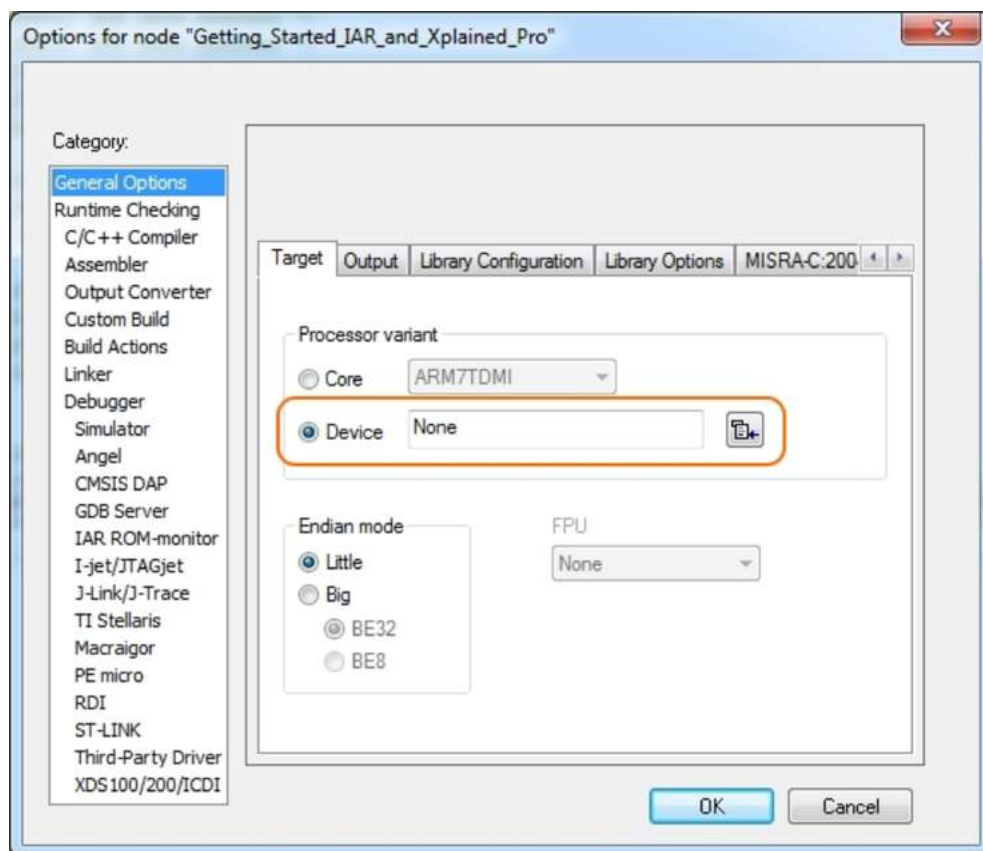


Figure 5-2. Select Debugger

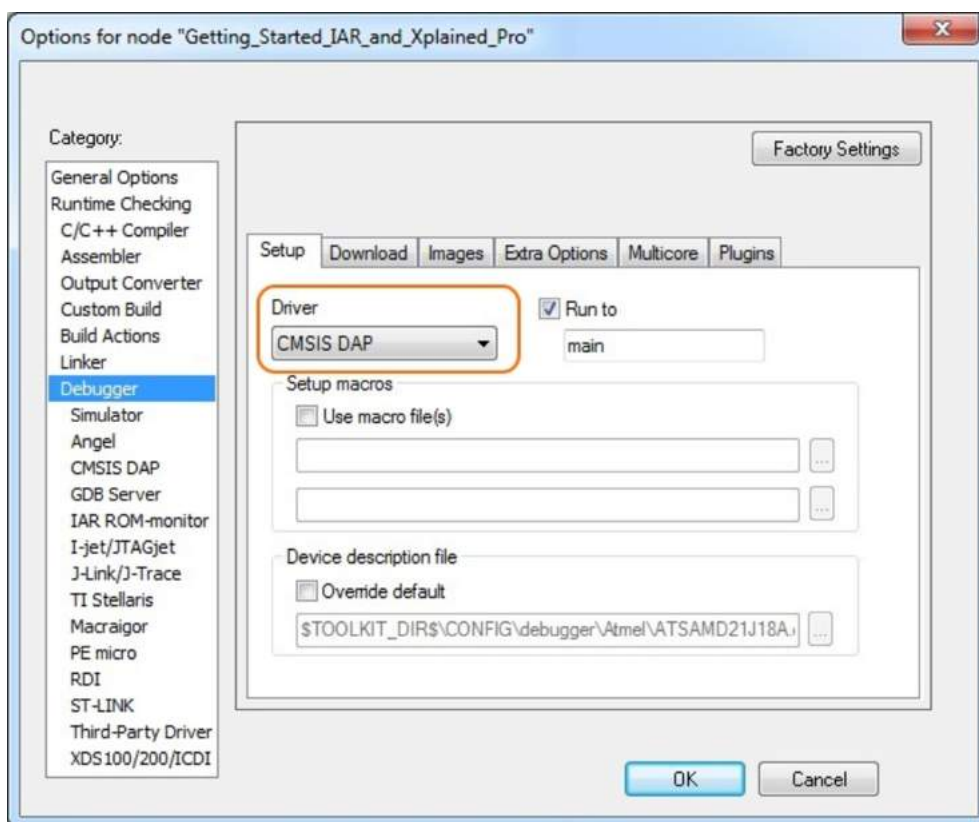


Figure 5-3. Configure Flash Loader

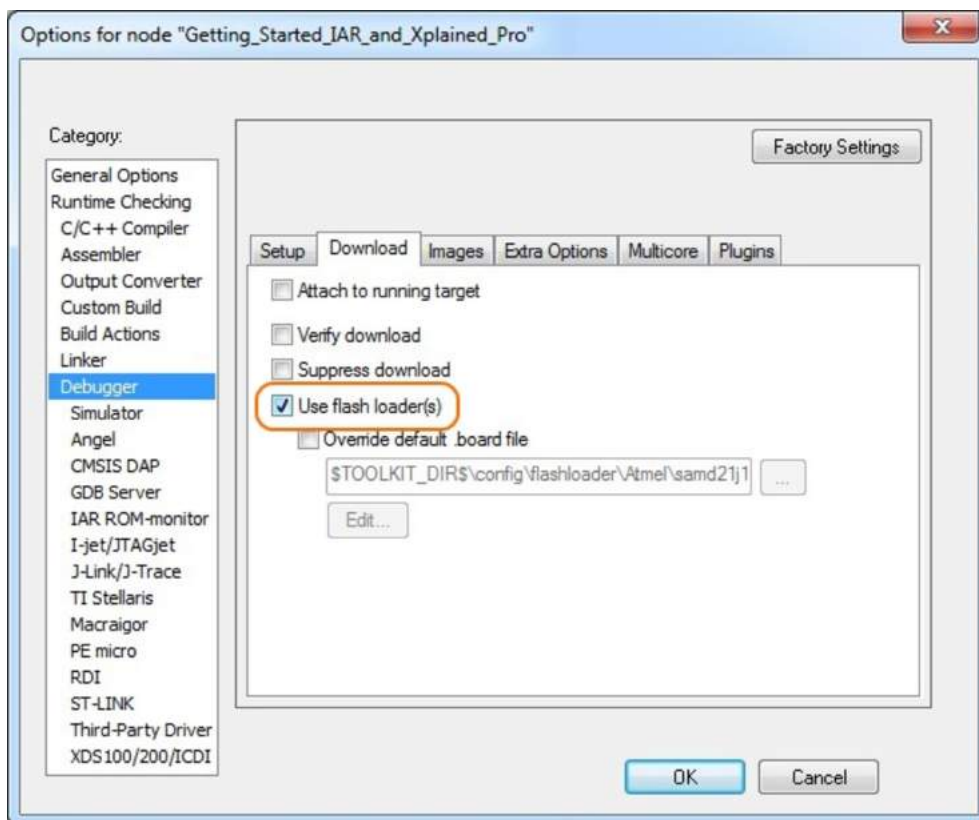


Figure 5-4. Configure Reset

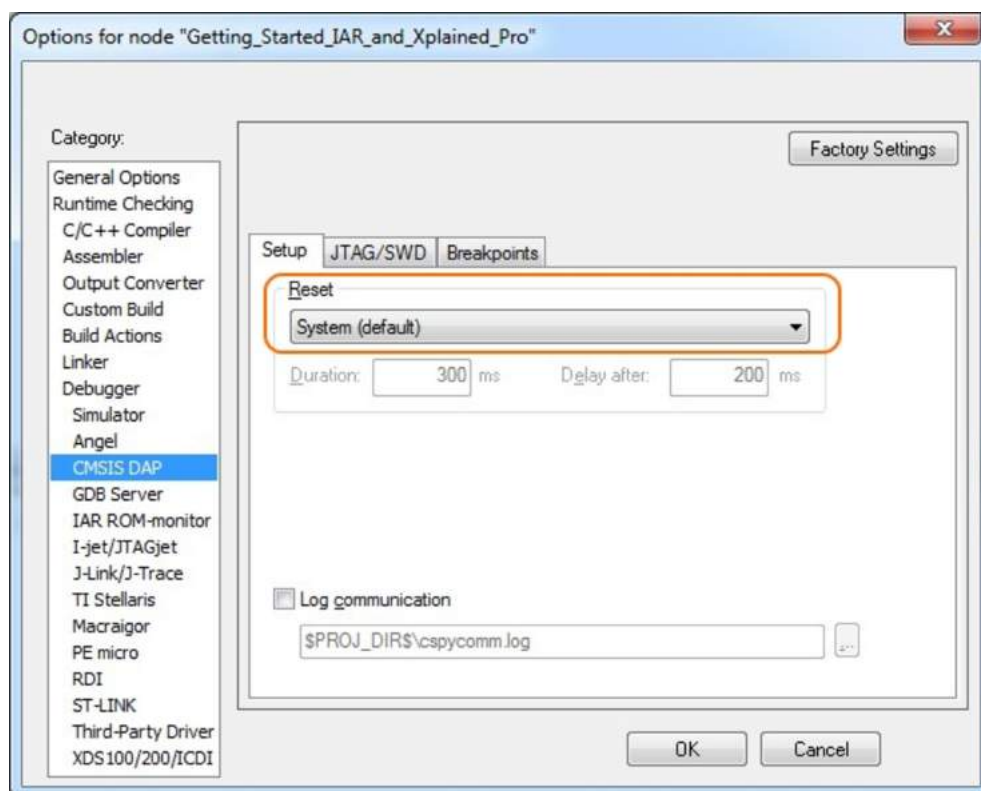
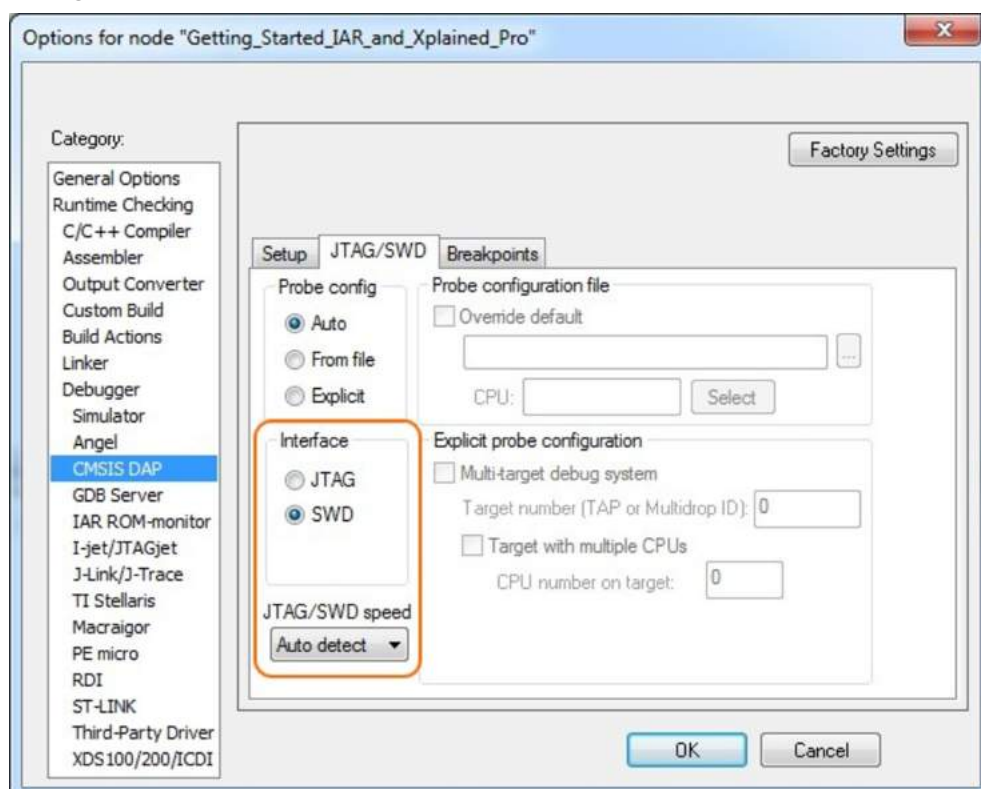


Figure 5-5. Configure Interface



## 5.2. Connecting a SAM-ICE to an Xplained Pro Board

Xplained Pro kits featuring a 10-pin 50mil debug connector can use external debug tools like SAM-ICE™ or Atmel-ICE instead of the built-in EDBG. Devices using SWD interface on-board will have a connector with the pinout compatible with the [Cortex Debug Connector](#).

You can connect the SAM-ICE 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 table and figures below for how to connect the SAM-ICE to the Xplained Pro board.

**Table 5-1. 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) <sup>(1)</sup> |
| 7 (Not used)    |                         |
| 8 (Not used)    |                         |
| 9 (Not used)    |                         |
| 10 (RESET)      | 15 (RESET)              |

**Note:**

1. Optional, if the device has this functionality.

**Figure 5-6. SAM-ICE using a Squid Cable**



Figure 5-7. SAM-ICE using an Atmel-ICE Adapter



**Important:**

If contention with the on-board EDBG occur, power the Xplained Pro board from another input like the external power header or from the target USB. Physically removing the connection between the EDBG and the debug header by removing 0Ω resistors, where available, or cutting the tracks to the EDBG can also be done.

## 6. Hardware Revision History and Known Issues

### 6.1. Identifying Product ID and Revision

The revision and product identifier of 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.

By connecting an Xplained Pro MCU board to a computer with Atmel Studio running, an information window will pop up. The first six digits of the serial number, which is listed under kit details, contain the product identifier and revision. Information about connected Xplained Pro extension boards will also appear in the Atmel Kit's window.

The same information can be found on the sticker on the bottom side of the PCB. Most kits will print the identifier and revision 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 QR-code, which contains a serial number string.

The serial number string has the following format:

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

The product identifier for SAM C21 Xplained Pro is A09-2419.

### 6.2. Revision 6

Revision 6 has silicon revision D or newer of the ATSAMC21J18A-AUTES (U300) device mounted, it is otherwise identical to revision 5.

### 6.3. Revision 5

Revision 5 fixes all known issues outlined on rev. 2-3. The power supply system is divided in two with a separate 3.3V regulator for both EDBG, and for the Target section. The power supply block diagram for revision 2 and 3 is shown below. The power switch has been redesigned to avoid voltage leakage at power on. The DAC, LIN, and CAN connectors have been moved to ease mounting in production. The RESET level-shifter has been redesigned to avoid leakage when target power is switched off.

**Figure 6-1. Revision 2 and 3 Power Supply Block Diagram**

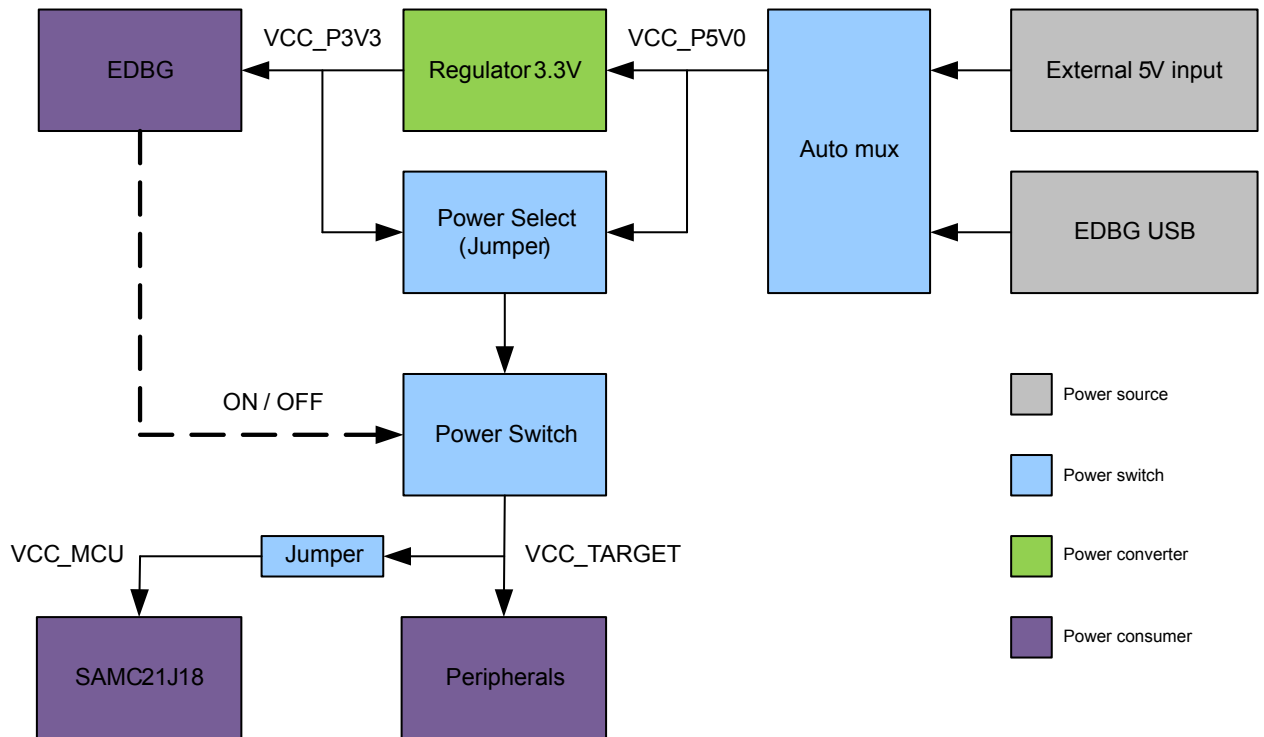


Figure 6-2. Revision 2 and 3 Connector Block Diagram

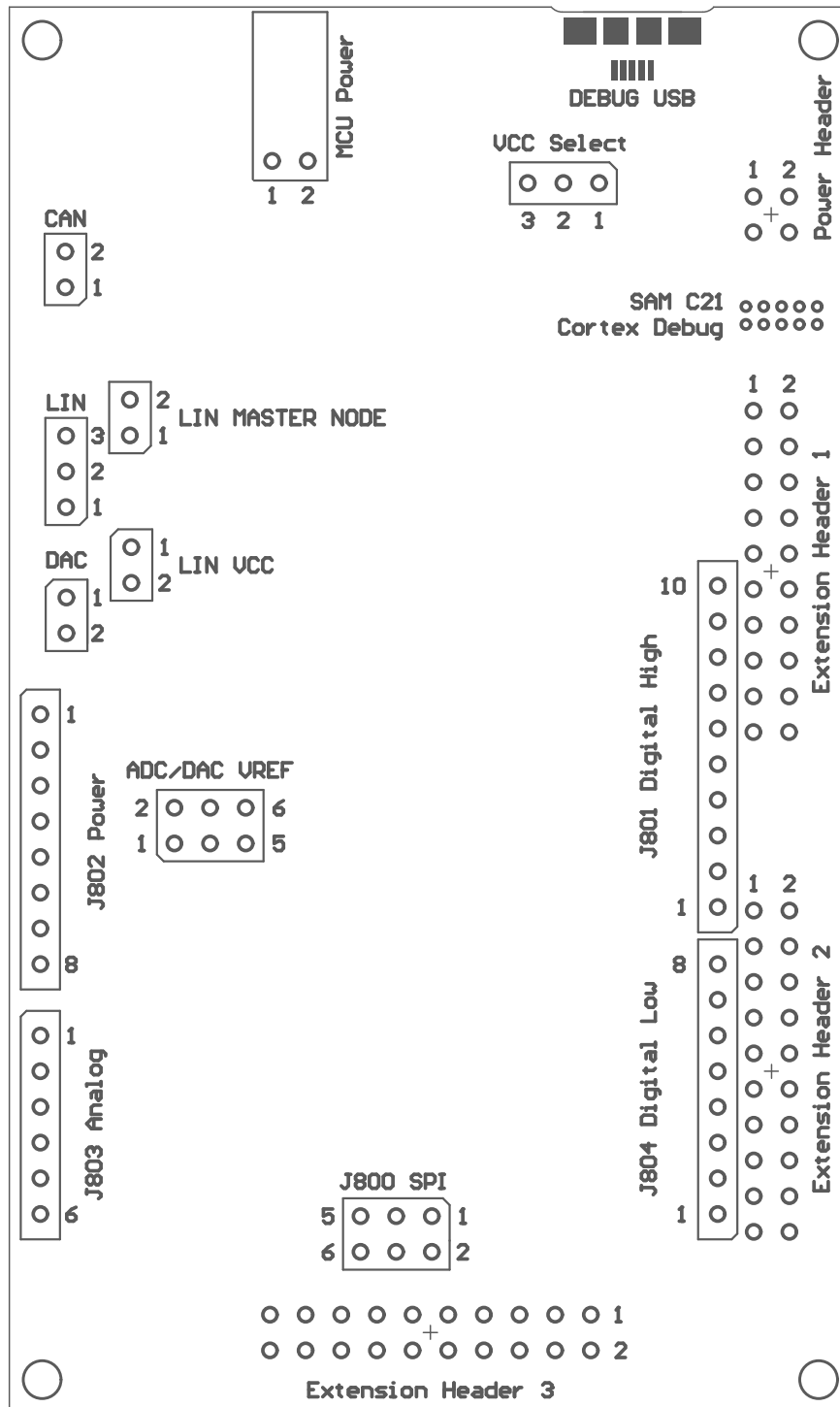


Figure 6-3. Revision 2 and 3 Top Side Resistor Overview

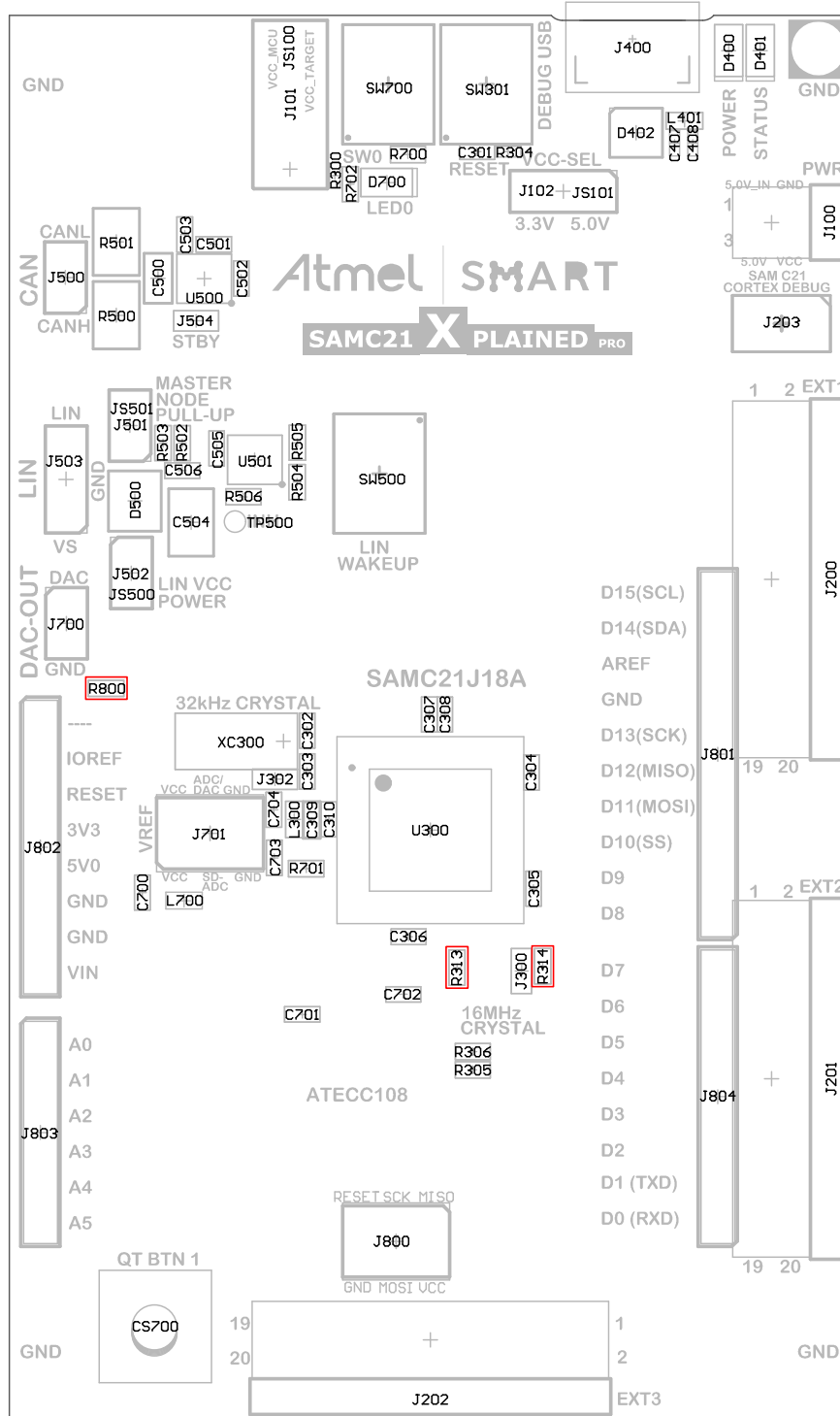
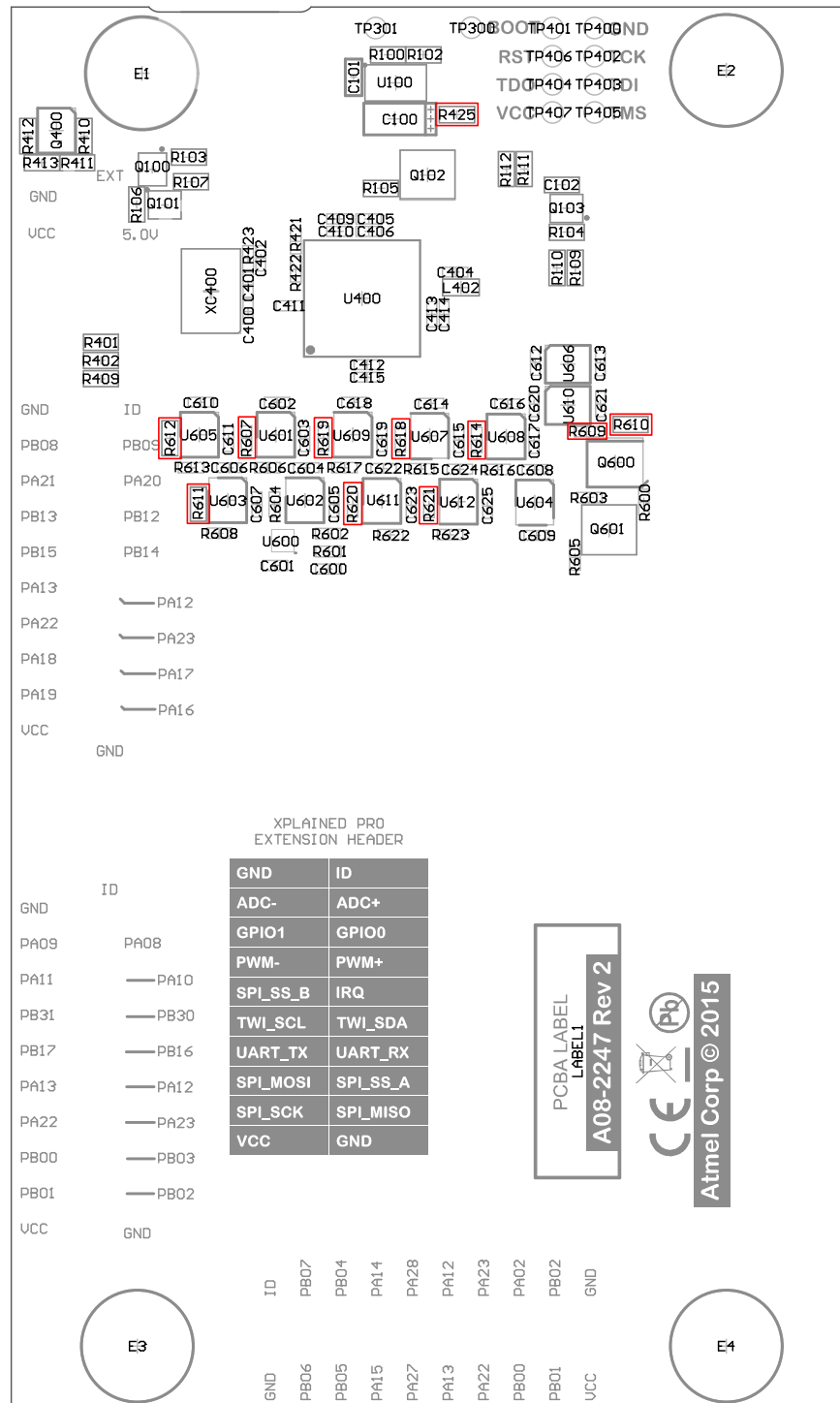


Figure 6-4. Revision 2 and 3 Bottom Side Resistor Overview



#### Related Links

[The QTouch Button PAD is not Connected on page 43](#)

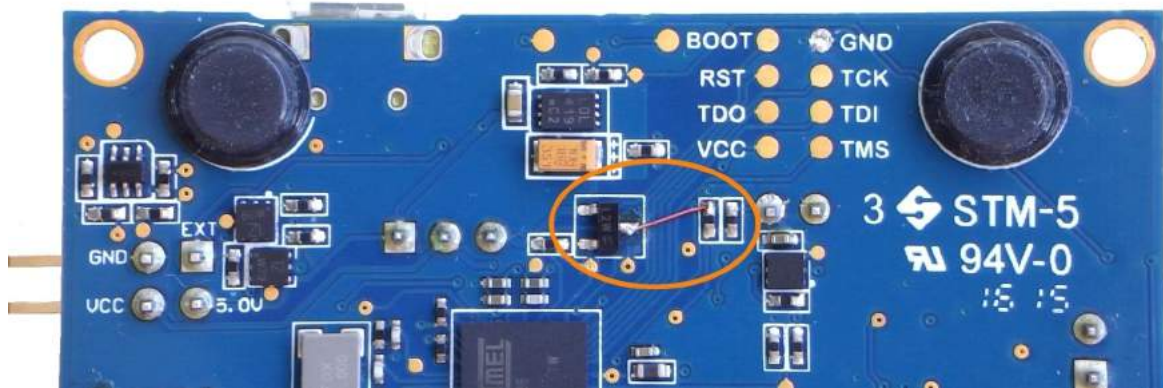
[Kit Does Not Work with 3.3V Target Voltage Selected on page 43](#)

[Revision 3 on page 43](#)

## 6.4. Revision 3

Revision 3 is almost identical to revision 2 with an additional quick fix for the 3.3V target supply problem. The fix is implemented by shorting Q102, pin 2 to GND as shown in the figure below. Also the QTouch pad is connected inside the PCB.

**Figure 6-5. Strap Fix**



### Related Links

[The QTouch Button PAD is not Connected](#) on page 43

[Kit Does Not Work with 3.3V Target Voltage Selected](#) on page 43

## 6.5. Revision 2

Revision 2 is the initial released revision. This revision has engineering samples mounted with part number ATSAMC21J18A-AUTES.

### 6.5.1. The QTouch Button PAD is not Connected

On Revision 2 of the kit, the QTouch button PAD is not connected to the track inside the PCB. This will cause the QTouch function to work only on the VIA connection point. There is no workaround for this issue. This will be fixed in next revision of the PCB.

### 6.5.2. Kit Does Not Work with 3.3V Target Voltage Selected

Revision 2 of the kit has a start-up problem when target voltage is set to 3.3V. When the EDBG opens the target voltage power switch from VCC\_TARGET\_SWITCH\_P3V3\_P5V0 to VCC\_TARGET\_P3V3\_P5V0 a power surge is observed. This power surge causes the VCC\_P3V3 nets voltage to decrease enough to trigger the EDBGs BOD, resulting in the EDBG entering a locked state where it can not be used.

**Fix/Workaround:** Use the kit with 5.0V selected as the target voltage.  
Force the target voltage switch open by connecting Q102 pin 2 to GND.



**Important:** Forcing the target voltage switch open will disable any protection for Xplained Pro extension modules connected to EXT1, EXT2, and EXT3. Make sure that connected extensions supports the selected target voltage.

### Related Links

[Revision 5](#) on page 38

## 7. Document Revision History

| Doc. rev. | Date    | Comment                                                        |
|-----------|---------|----------------------------------------------------------------|
| 42460D    | 08/2016 | Updated revision history with information about kit revision 6 |
| 42460C    | 10/2015 | Fix broken link and updated with kit revision 5                |
| 42460B    | 07/2015 | Updated with kit revision 3                                    |
| 42460A    | 05/2015 | Initial document release                                       |

## 8. Evaluation Board/Kit Important Notice

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