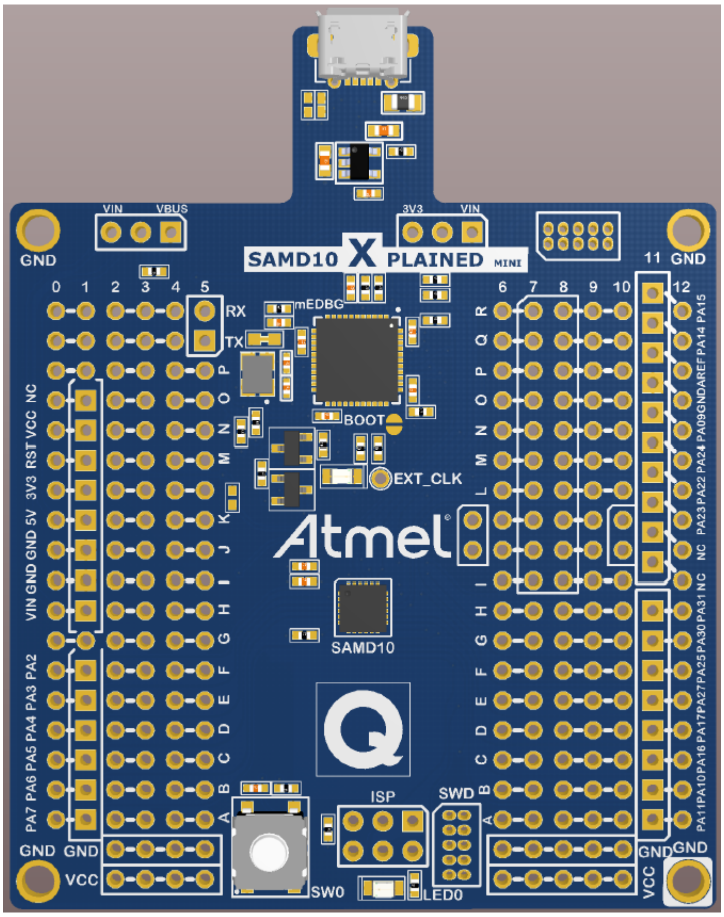
USER GUIDE

ATSAMD10 Xplained Mini User Guide



Introduction

This user guide describes how to get started with the Atmel® ATSAMD10 Xplained Mini board.

The ATSAMD10 Xplained Mini evaluation kit is a hardware platform to evaluate the Atmel ATSAMD10 microcontroller. The evaluation kit comes with a fully integrated debugger that provides seamless integration with Atmel Studio 6.2 (and later version). The kit provides access to the features of the ATSAMD10 enabling easy integration of the device in a custom design.

Table of Contents

1. Getting Started

1.1 Features

The ATSAMD10 Xplained Mini evaluation board provides a development platform for the Atmel ATSAMD10.

1.2 Design Documentation and Related Links

The most relevant documents and software for the evaluation board is available here:

http://www.atmel.com/tools/SAMD10-XMINI.aspx

1.3 Board Assembly

The Xplained Mini board is very flexible and can be used in a number of ways. E.g. as your own prototype for SW development and HW verification.

1.3.1 In Customer Development Assembly

The ATSAMD10 Xplained Mini board can be wired into the customer prototype assembly by using the on-board connector grid, where the target signals are available.

1.3.2 Connecting an Arduino Shield

By assembling receptacles in the marked positions (J200, J201, J202, and J203) Arduino® shields can be mounted.

1.3.3 Standalone Node

The ATSAMD10 Xplained Mini board can be used as a standalone node - use the 4xAAA or 2xAAA battery pack available in Atmel store to provide power.

1.4 Connecting the Kit

How to connect the evaluation board.

1.4.1 Connect the Kit to Atmel Studio

How to connect the ATSAMD10 Xplained Mini board to Atmel Studio.

1. Download and install Atmel Studio[1] version 6.2 or later.

2. Launch Atmel Studio.

3. Connect the board to the USB port and it will be visible in Atmel Studio.

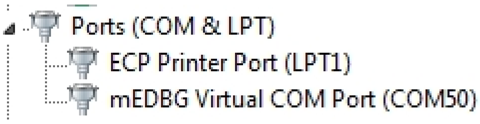
1.4.2 Connect the Target UART to the mEBDG COM Port

All Xplained Mini boards have an embedded debugger (mEBDG) with a number of features, among them a CDC/COM port which enables the user to connect the ATSAMD10 UART to the PC.

1. Connect the mEDBG USB to the PC.

2. Use the Device Manager to find the COM port number.

3. Default COM port settings are 9600baud N81. The COM port settings can be changed using the Device Manager.



Ports (COM & LPT)
ECP Printer Port (LPT1)
mEDBG Virtual COM Port (COM50)

1.5 Programming and Debugging

How to program and debug the Xplained Mini board.

[1] http://www.atmel.com/tools/atmelstudio.aspx

1.5.1 Programming the Target Using mEDBG

Using the Embedded Debugger on the Xplained Mini board to program the ATmega328 via the SPI bus.

1. Connect the mEDBG USB to the PC.
2. Go to Atmel Studio: click Tools, select Device Programming, and select the connected mEDBG as Tool with Device = ATSAMD10 and Interface = SWD, click Apply.
3. Select "Memories" and locate the source hex or elf file and click Program.

1.5.2 Debugging the Target Using mEDBG

Using the Embedded Debugger on the Xplained Mini board to debug the ATSAMD10 via SWD.

1. Start Atmel Studio.
2. Connect the mEDBG USB to the PC.
3. Open your project.
4. In the Project menu select the project properties page, select the Tools tab and select mEDBG as debugger and SWD as interface.
5. In the Debug menu click Start Debugging and Break.
6. A debug session is started with a break in main, debugging can start.

1.5.3 Programming the Target Using an External Programmer

How to program the target ATSAMD10 using the Atmel ICE.

1. Connect the External Programmer to the PC.
2. Connect the External Programme to the evaluation board SWD connector
3. Go to Atmel Studio: Tools/Device Programming, and select the External Programmer connected as Tool, Select Device = ATSAMD10, Interface = SWD and click Apply.
4. Select "Memories" and locate the source hex or elf file and click Program.

1.5.4 Programming the ATmega32U4 Using an External Programmer

How to program the ATmega32U4 using the AVR® JTAGICE mkII, JTAGICE3, or other Atmel Programmers.

To restore the mEDBG FW use the /tools/mEDBG/mEDBG_fw.zip from the Studio installation.

1. Connect the External Programmer to the PC.
2. Connect the External Programmer to the board connector (J100).
3. Go to Atmel Studio: Tools/Device Programming, and select the External Programmer connected as Tool, select Device = ATmega32U4, Interface = JTAG and click Apply.
4. Select "Memories" and locate the source hex or elf file and click Program.
5. If the source contain fuse settings go to "Production file" and upload the elf file and program the fuses.

   Recommended fuse setting:

   BODLEVEL = 2.6V
   HWBE = [X]
   OCDEN = [ ]
   JTAGEN = [X]
   SPIEN = [X]
   WDTON = [ ]
   EESAVE = [X]
   BOOTSZ = 2048W_3800

BOOTRST = [ ]

CKDIV8 = [ ]

CKOUT = [X]

SUT_CKSEL = EXTXOSC_8MHZ_XX_258CK_65MS

Note CKOUT must be enabled the provide external clock to the target.

1.5.5 Programming the ATmega32U4 Using a Bootloader

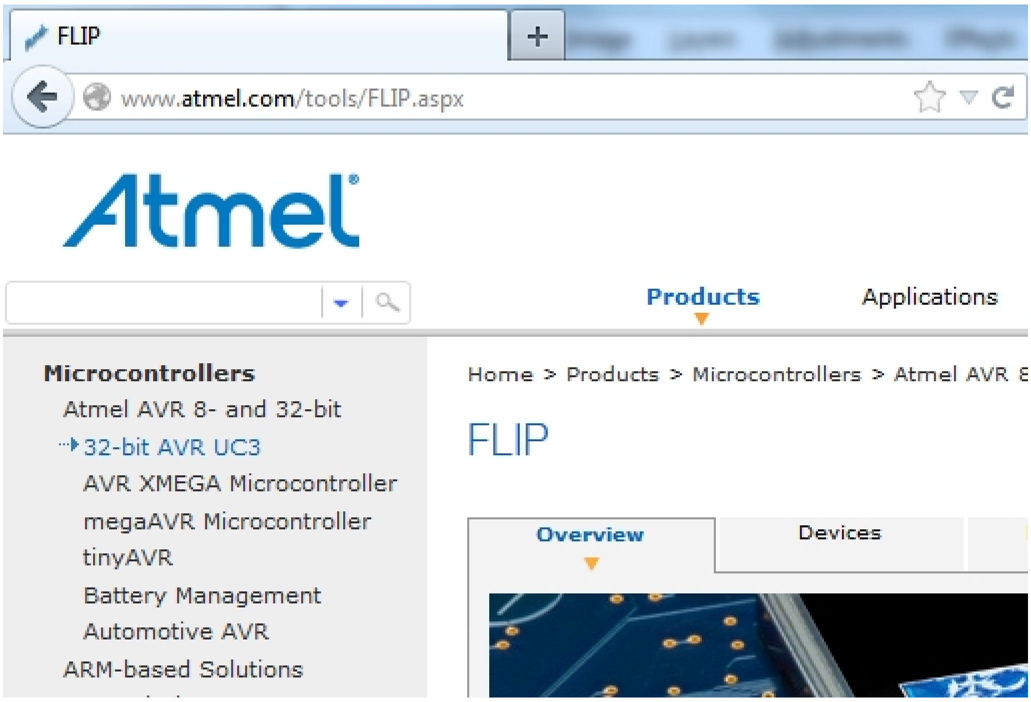
This section describes how to use the bootloader to program the ATmega32U4.

1. Install the Bootloader interface on the PC as described in “How to Install the "Bootloader PC tool"” on page 5.
2. Start the Bootloader PC GUI "FLIP".
3. Short strap J102.
4. Connect the board USB connector to the PC.
5. Select Device = ATmega32U4 (Device - Select).
6. Select USB communication (**Ctrl+U**).
7. Select memory area to program (Use the toggle memory button bellow the Atmel logo).
8. Select Load Hex file (**Ctrl+L**).
9. Select Programming Options.
10. Click "Run", observe status in status field.

1.5.6 How to Install the "Bootloader PC tool"

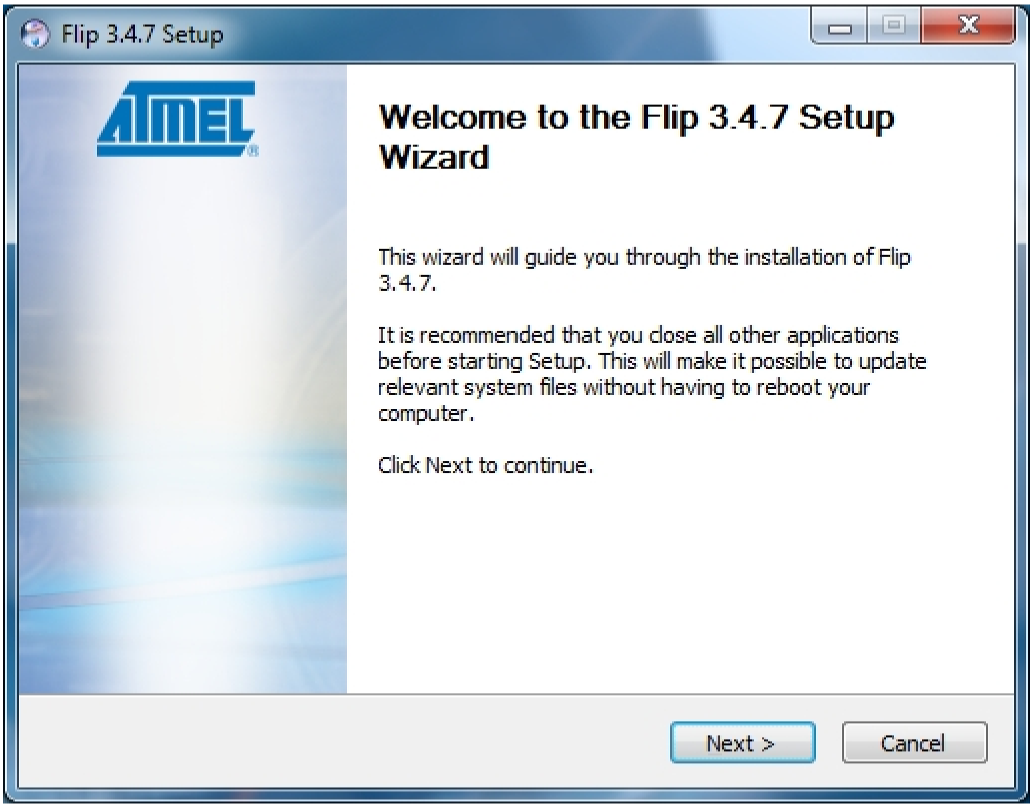
How to install the Bootloader PC GUI tool.

1. Download the FLIP "in system programming tool" installer from http://www.atmel.com/tools/FLIP.aspx[2].



[2] http://www.atmel.com/tools/FLIP.aspx

2. Run the FLIP Installer.



Welcome to the Flip 3.4.7 Setup Wizard

This wizard will guide you through the installation of Flip 3.4.7.

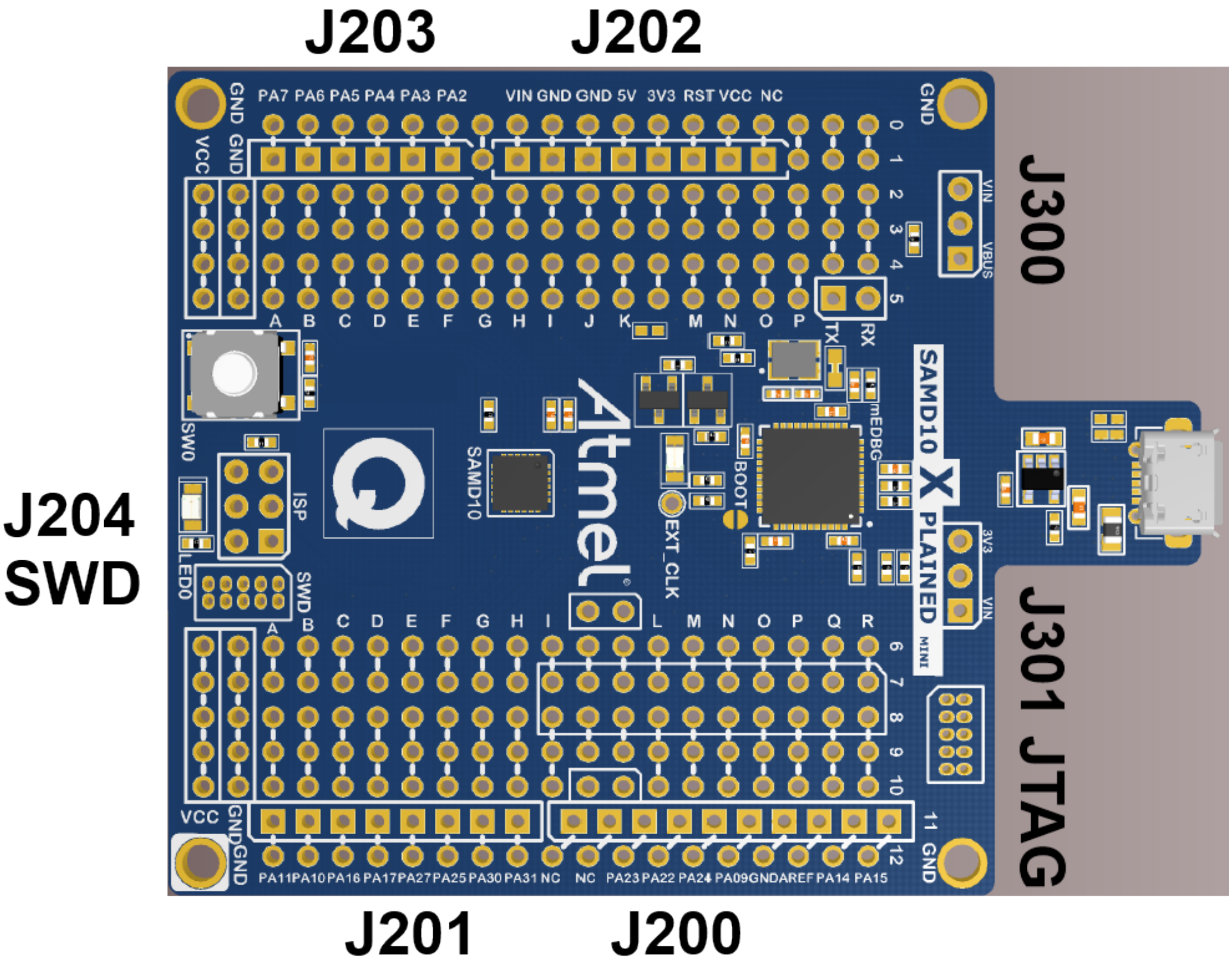
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

2. Hardware User Guide

2.1 Board Overview

Figure 2-1. ATSAMD10-XMINI Overview


J203
J202
J204
SWD
J300
J301 JTAG
J201
J200
GND PA7 PA6 PA5 PA4 PA3 PA2 VIN GND GND 5V 3V3 RST VCC NC
PA11 PA10 PA16 PA17 PA27 PA25 PA30 PA31 NC NC PA23 PA22 PA24 PA09 GND AREF PA14 PA15
VCC GND
SW0
ISP
LED0
SWD
SAMD10
Atmel
EXT_CLK
BOOT
mEDBG
TX
RX
SAMD10 XPLAINED MINI
VIN
VBUS
3V3

2.2 Clock Distribution

The ATmega32U4 (mEDBG) has an external 16MHz XTAL.

The ATmega32U4 provides an external 8MHz clock to the ATSAMD10 (target), this 8MHz clk is connected to PA08.

The external 8Mhz clk can be used as a accurate clk reference.

2.3 Headers and Connectors

The board headers and connectors.

2.3.1 JTAG (J100)

J100 is the JTAG programming header typically used by the JTAGICE for programming of the ATmega32U4 (mEDBG).

Table 2-1. J100 JTAG Header

J100 pin	Signal function
1	JTAG_TCK

J100 pin	Signal function
2	GND
3	JTAG_TDO
4	VCC (5V0)
5	JTAG_TMS
6	RESET
7	NC
8	NC
9	JTAG_TDI
10	GND

2.3.2 USB (J101)

J101 is a Micro-B USB connector connected to the embedded debugger (ATmega32U4).

Table 2-2. J101 USB Connector

J101 pin	Function
1	VBUS
2	D-
3	D+
4	NC
5	GND

2.3.3 USART (J104)

The ATmega32U4 USART signals are available on J104 USART header.

The mEDBG CDC COM port is connected to these signals.

Table 2-3. J104 USART Header

J104 pin	ATmega32U4	ATSAMD10	Function
1 - UART TXD	PD3	PA11/RxD	TxD out from ATmega32U4.
2 - UART RXD	PD2	PA10/TxD	RxD in to ATmega32U4.

2.3.4 Target Digital I/O (J200 and J201)

The J200 and J201 headers provide access to ATSAMD10 digital I/O pins.

Table 2-4. J200 I/O High Header

J200 pin	ATSAMD10 pin		Note
J200-1	NC	D8	Easy to strap to any ATSAMD10 pin
J200-2	NC	D9	Easy to strap to any ATSAMD10 pin
J200-3	PA23/SPI-SS	D10	SPI-SERCOM1 or PWM TCC0/WO[5]
J200-4	PA22/SPI-MOSI	D11	SPI-SERCOM1 or PWM TCC0/WO[4]
J200-5	PA24/SPI-MISO	D12	SPI-SERCOM1 or PWM TCC0/WO[2]
J200-6	PA09/SCK	D13	Yellow USER LED D200 connected. - SPI-SERCOM1
J200-7	GND		
J200-8	PA03/AREF		
J200-9	PA14/SDA		TWI Serial Data. SERCOM2
J200-10	PA15/SCL		TWI Serial Clock. SERCOM2

Table 2-5. J201 I/O Low Header

J201 pin	ATSAMD10 pin		Note
J201-1	PA11/RxD	D0	Target USART Receive Pin. SERCOM0
J201-2	PA10/TxD	D1	Target USART Transmit Pin. SERCOM0
J201-3	PA16	D2	
J201-4	PA17	D3	PWM TCC0/WO[7]
J201-5	PA27	D4	
J201-6	PA25	D5	PWM TCC1/WO[5]
J201-7	PA30	D6	PWM TC2/WO[0]
J201-8	PA31	D7	

2.3.5 Target Analogue I/O (J203)

The ATSAMD10 analogue I/O pins are available in the J203 header.

Table 2-6. J200 Analogue Header

J203 pin	ATSAMD10 pin	
J203-1	PA02	AIN[0]
J203-2	PA03	AIN[1]
J203-3	PA04	AIN[2]
J203-4	PA05	AIN[3]
J203-5	PA06	AIN[4]
J203-6	PA07	AIN[5]

2.3.6 Power (J202, J300, J301)

The J300 and J301 headers enables selection of power sources and target supply power, the J202 header enables connection to the power system.

Table 2-7. J202 Power Header

J202 pin	Signal	Description
1	NC.	
2	VCC_TARGET	ATSAMD10 supply voltage.
3	RESET_SENSE	RESET from external source, monitored by the mEDBG, if pulled low the target RESET line will be pulled low. This functionality is NOT available during a debugging session.
4	VCC_P3V3	3.3V from on-board DC/DC converter (U300).
5	VCC_P5V0	Voltage from the selected power source, default VBUS.
6	GND	
7	GND	
8	VCC_VIN	The externally connected power source if any.

2.3.6.1 Power Supply Configuration

The J300 and J301 headers enables Power supply configuration.

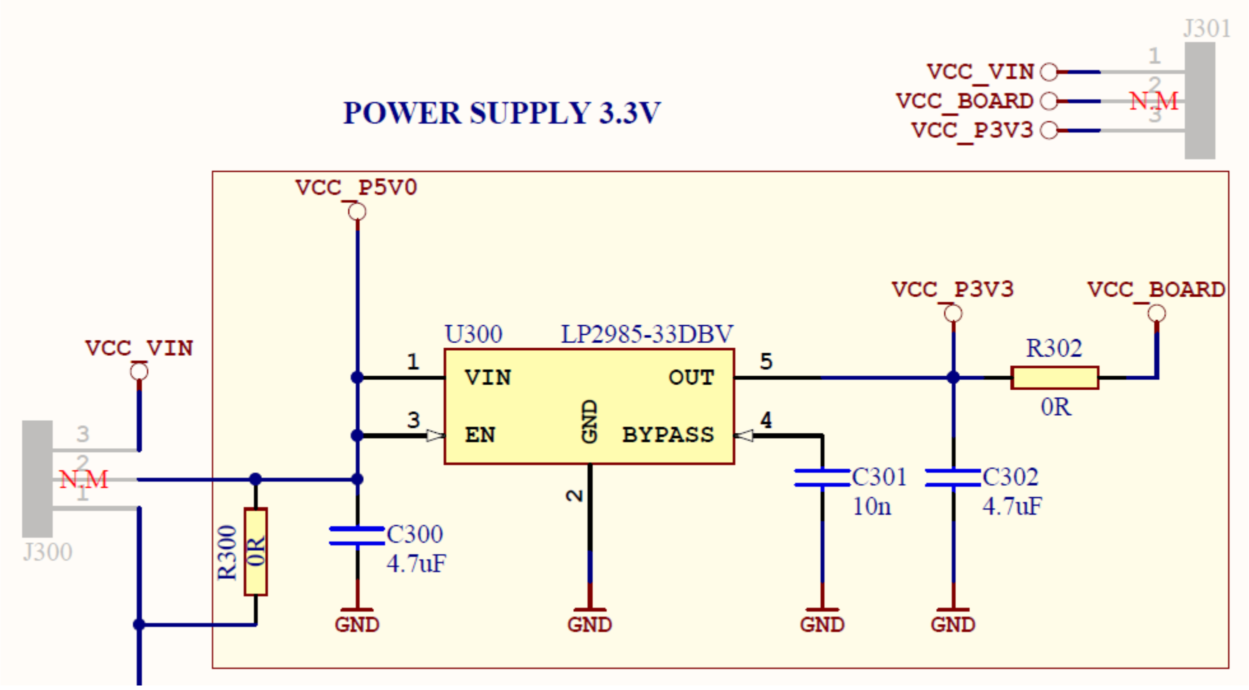


Table 2-8. J300 Board External Power Selection

J300 pin	Signal	Description
1	VCC_VBUS	VBUS Pin of USB Connector via fuse F100, by default connected to VCC_P5V0 via R300.
2	VCC_P5V0	Input voltage (4.3 to 16V) for the fixed-output voltage regulator (U300).
3	VCC_VIN	Alternative power source for the board (4.3 to 16V) from J202.8, study U300 data sheet for detail requirements.

Table 2-9. J301 Board Power Supply Selection

J301 pin	Signal	Description
1	VCC_VIN	Board external power source - enable connection of external source to ATSAMD10.
2	VCC_BOARD	Power supply for ATmega32U4 and ATSAMD10.
3	VCC_P3V3	Board 3.3V power supply from U300, by default connected to VCC_BOARD via R302.

2.3.7 Target SPI (J204)

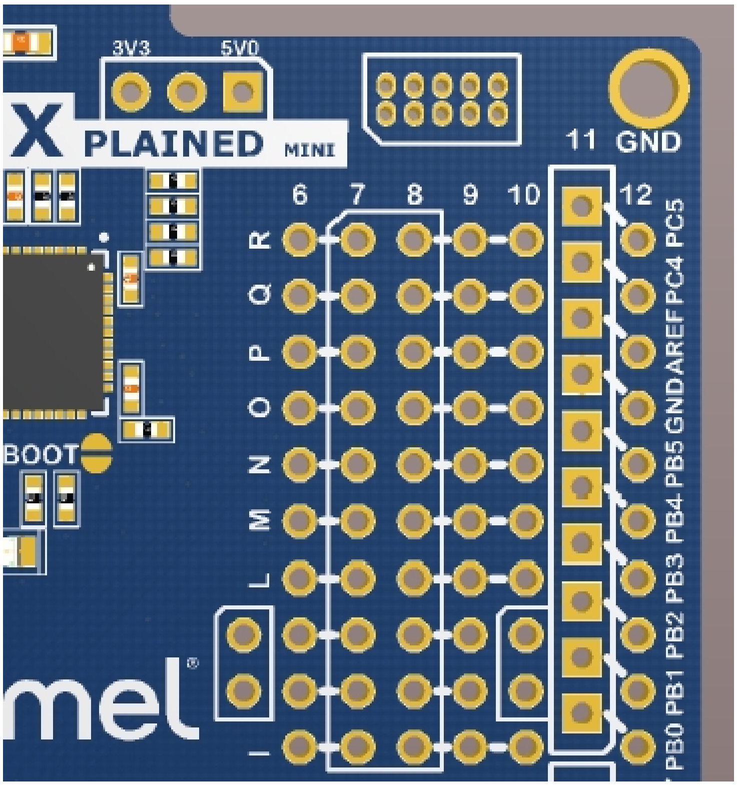
The J204 header enable direct connection to ISP for programming of the ATSAMD10 or to use the SPI bus to connect external equipment.

Table 2-10. J204 SPI Header

J204 pin	Function
1	MISO (PA24)
2	VCC target (ATSAMD10)
3	SCK (PA09)
4	MOSI (PA22)
5	RESET
6	GND

2.3.8 Extension Headers

The marked area on the grid I7 to R8 can be used for strapping in a Xplained PRO extension header and a few other headers based on the SPI bus.



The general bus connections for a Xplained PRO Extension board is indicated in the Table 2-12, detailed wiring can be found in the selected Extension board documentation.

Table 2-11. Xplained Pro Extension Header

Pin	Name	Typical µC signal	Typical grid pin	Extension signal description
1	ID	NC		Communication line to the ID chip on extension board.
2	GND			Ground.
3	ADC(+)			Analogue to digital converter, positive part of differential ADC.
4	ADC(-)			Analogue to digital converter, 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. RESET to RF Extension board.
8	PWM(-)			Pulse width modulation, alternatively positive part of differential PWM.
9	IRQ/GPIO			Interrupt request line from extension board.
10	SPI_SS_B/ GPIO			Slave select for SPI and/or general purpose I/O. Wake up interrupt to RF extension (SLP_TR).
11	TWI_SDA	PC4/SDA	M6 to Q12	Data line for two-wire interface.
12	TWI_SCL	PC5/SCL	M9 to R12	Clock line for two-wire interface.

Pin	Name	Typical µC signal	Typical grid pin	Extension signal description
13	USART_RX	PD0/RXD	L6 to A12	USART Input Pin from extension board, remove R107 if used.
14	USART_TX	PD1/TXD	L9 to B12	USART Output Pin to extension board, remove R108 if used.
15	SPI_SS_A	PB2/SS	K6 to K5.5	Slave select for Serial peripheral interface.
16	SPI_MOSI	PB3/MOSI	K9 to K10	Master out slave in line of Serial peripheral interface.
17	SPI_MISO	PB4/MISO	J6 to J5.5	Master in slave out line of Serial peripheral interface.
18	SPI_SCK	PB5/SCK	J9 to J10	Clock for Serial peripheral interface.
19	GND		I6 to GND	Ground.
20	VCC		I9 to VCC	Power for extension board.

A number of Xplained PRO Extensions can be found at http://www.atmel.com/products/microcontrollers/avr/xplainedpro.

Using Pin 11 to 20 enables connection of the 10-pin connector used on the RZ600 wireless modules and the 10-pin Xplained sensor modules.

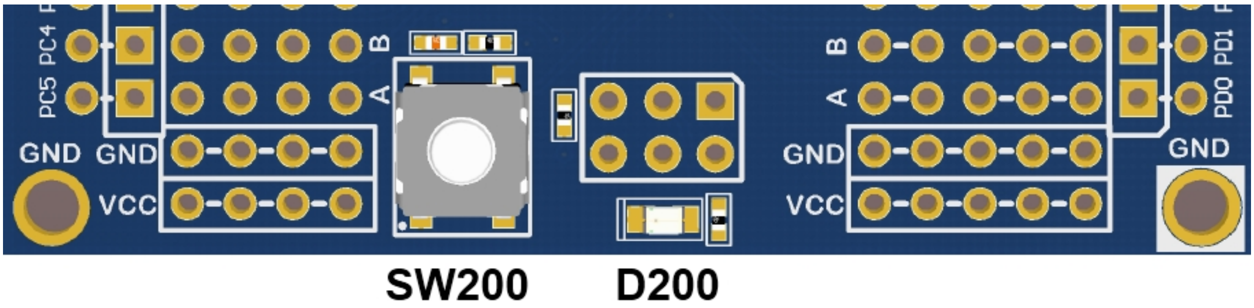
2.4 Board GUI

2.4.1 LEDs

There are One LED available for use by the application SW and one for the mEDBG.

Table 2-12. LEDs

LED	Function
D100 - Green	mEDBG, will light during enumeration, programming and debug.
D200 - Yellow	User LED - ATSAMD10 PA09



2.4.2 Buttons

A mechanical and a touch button is available for general use by application SW.

Table 2-13. Buttons

Button	Function	ATSAMD10 pin
SW200	User defined high signal, press to ground (negate).	PA25
QT200	Qtouch button	PA07

2.5 Factory Programmed Data

The ATmega32U4 is preprogrammed with the mEDBG.

The ATSAMD10 is preprogrammed with a demo program, ReMorse.

When the CDC COM port is connected to a terminal window (9600/N81), the text you write will be transmitted via the LED in Morse code. Any Morse code transmitted by using the switch will be displayed as text in the terminal window.

3. Document Revision History

Document revision	Date	Comment
42387A	02/2015	Initial document release

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