Atmel Smart Microcontrollers

SAMHA1G16A Xplained Pro

USER GUIDE

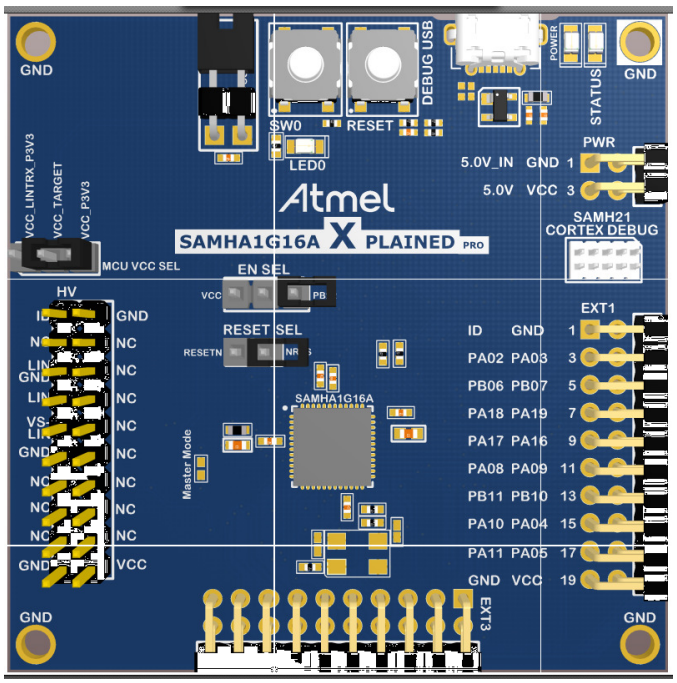
Preface

The Atmel® SAMHA1G16A Xplained Pro evaluation kit is a hardware platform to evaluate the ATSAMHA1G16A microcontroller.

Supported by the Atmel Studio integrated development platform, the kit provides easy access to the features of the Atmel ATSAMHA1G16A 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 ATSAMHA1G16A.

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



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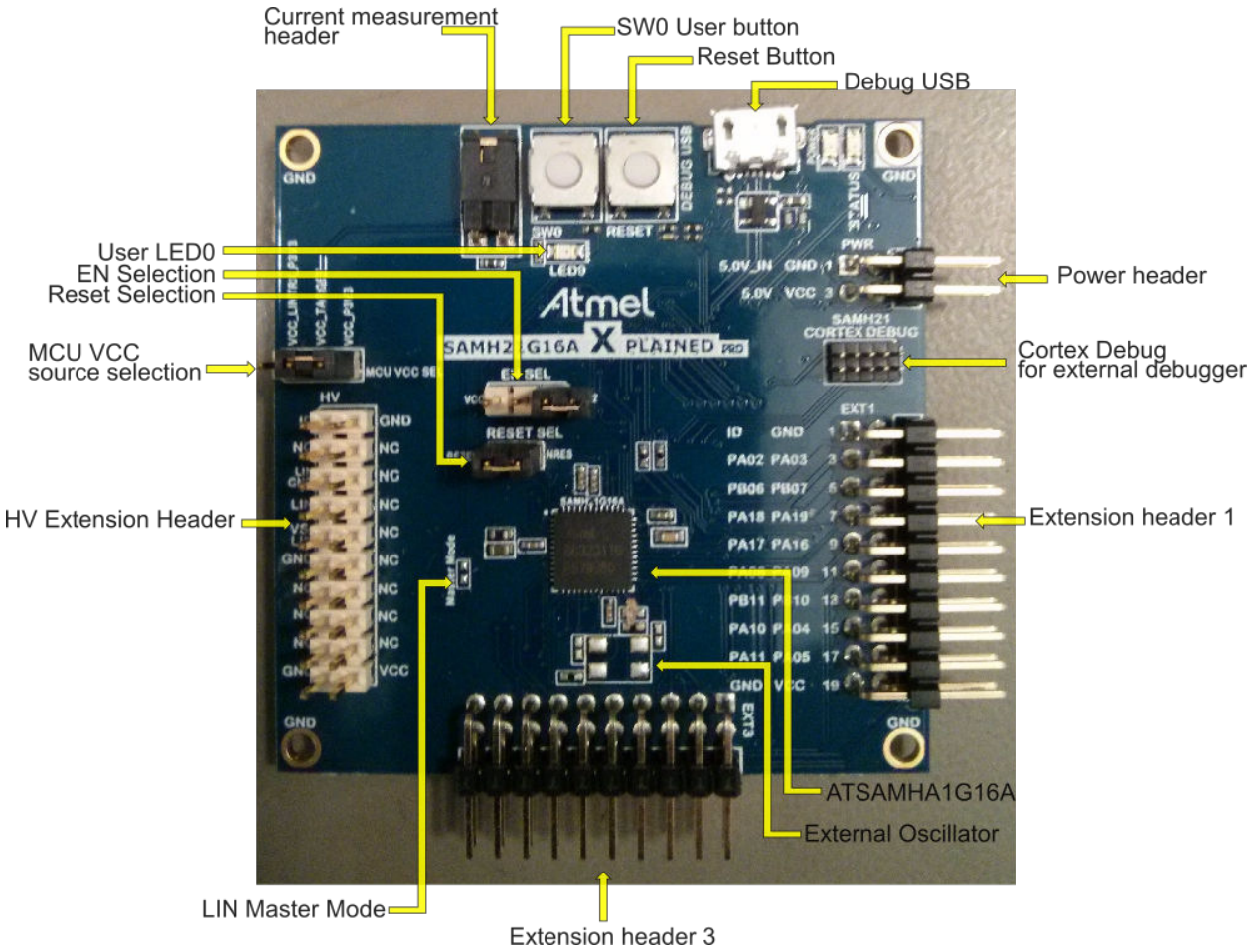
1. Introduction

1.1. SAMHA1G16A Xplained Pro Introduction

The Atmel SAMHA1G16A Xplained Pro evaluation kit is a hardware platform to evaluate the Atmel ATSAMHA1G16A.

The kit offers a set of features that enables the ATSAMHA1G16A user to get started with the SAM HA1 peripherals right away and to get an understanding of how to integrate the device in their own design.

Figure 1-1. SAMHA1G16A Xplained Pro Evaluation Kit Overview



1.2. SAMHA1G16A Xplained Pro Feature list

- SAMHA1G16A System in Package
- One mechanical reset button
- One mechanical programmable button
- One yellow user LED
- Two Xplained Pro extension headers
- One High-Voltage extension header
- Embedded Debugger

  - Auto-ID for board identification in Atmel Studio
  - One yellow status LED
  - One green board power LED
  - Programming and debugging
  - Data Gateway Interface: I^2C, SPI and four GPIOs
  - Virtual COM port (CDC)
- USB powered
- Supported with application examples in Atmel Software Framework

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 a USB cable (Standard-A to Micro-B or Micro-AB) between the PC and the DEBUG USB port on the kit.

When the Xplained Pro MCU kit is connected to your computer for the first time, the operating system will perform a driver software installation. 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.

Once the Xplained Pro MCU board is powered the green power LED will be lit and Atmel Studio will auto detect which Xplained Pro MCU- and extension board(s) are connected. Atmel Studio will present relevant information like datasheets and kit documentation. The kit landing page in Atmel Studio also has the option to launch Atmel Software Framework (ASF) example applications for the kit. The SAM HA1 device is programmed and debugged by the on-board Embedded Debugger and therefore no external programmer or debugger tool is needed.

2.2. SAMHA1G16A Xplained Pro Design Documentation and relevant links

The following list contains links to the most relevant documents and software for the SAMHA1G16A Xplained Pro.

- **Xplained Pro products** - Atmel Xplained Pro is a series of small-sized and easy-to-use evaluation kits for Atmel microcontrollers and other Atmel products. It consists of a series of low-cost MCU boards for evaluation and demonstration of features and capabilities of different MCU families.
- **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.
- **SAMHA1G16A 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 SAMHA1G16A 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 ATSAMHA1G16A. On SAMHA1G16A Xplained Pro, the SWD interface is connected between the EDBG and the ATSAMHA1G16A.

The Virtual COM Port is connected to a UART on the ATSAMHA1G16A 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 ATSAMHA1G16A 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 ATSAMHA1G16A. 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 ATSAMHA1G16A 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 SAMHA1G16A 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 SAMHA1G16A Xplained Pro kit can be powered by several power sources as listed in the table below.

Table 3-3. Power Sources for SAMHA1G16A Xplained Pro

Power input	Voltage requirements	Current requirements	Connector marking
External power	5V ±2% (±100mV) for USB host operation. 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. 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
External HV input	6V to 28V	Voltage regulator in SBC is specified for up to 85mA. This input also supplies the LIN Bus and all the other features of the SBC. It's recommended to use at least 500mA.	VS and GND on Connector HV

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.
3. External HV input

Note: The selection for the supply of the Target MCU has a separate connector. The above priority selects which supply is used to power the EDBG and the VCC_P3V3_CON.

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/ GPIO	Slave select for SPI and/or general purpose I/O
11	I^2C_SDA	Data line for I^2C interface. Always implemented, bus type.
12	I^2C_SCL	Clock line for I^2C 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.
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 SAMHA1G16A 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 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	Regulated 3.3V (output, used as main power supply for the kit)

3.4.3. [COMMON] Xplained Pro HV Header

Enter a short description of your topic here (optional).

This is the start of your topic.

4. Hardware User Guide

4.1. Connectors

This chapter describes the implementation of the relevant connectors and headers on SAMHA1G16A Xplained Pro and their connection to the ATSAMHA1G16A. The tables of connections in this chapter also describes which signals are shared between the headers and on-board functionality.

4.1.1. Xplained Pro Extension Headers

The SAMHA1G16A Xplained Pro header EXT1 offers access to the I/O of the microcontroller in order to expand the board e.g. by connecting extensions to the board. This header is based on the standard extension header specified in Table 3-4 . The header has a pitch of 2.54mm.

Table 4-1. Extension Header EXT1

EXT1 pin	SAMHA1 pin	Function	Shared functionality
1 [ID]	-	-	Communication line to the ID chip on an extension board.
2 [GND]	-	-	Ground.
3 [ADC(+)]	PA02	AIN[0]	
4 [ADC(-)]	PA03	AIN[1]	
5 [GPIO1]	PB06	GPIO	
6 [GPIO2]	PB07	GPIO	
7 [PWM(+)]	PA18	TC3/WO[0]	DGI_SPI_SS
8 [PWM(-)]	PA19	TC3/WO[1]	
9 [IRQ/GPIO]	PA17	IRQ1/GPIO	DGI_SPI_SCK
10 [SPI_SS_B/GPIO]	PA16	GPIO	DGI_SPI_MISO
11 [TWI_SDA]	PA08	SERCOM2 PAD[0] I^2C SDA	EDBG I^2C
12 [TWI_SCL]	PA09	SERCOM2 PAD[1] I^2C SCL	EDBG I^2C
13 [USART_RX]	PB11	SERCOM4 PAD[3] UART RX	
14 [USART_TX]	PA10	SERCOM4 PAD[2] UART TX	
15 [SPI_SS_A]	PA10	SPI Master SS	
16 [SPI_MOSI]	PA04	SERCOM0 PAD[0] SPI MOSI	
17 [SPI_MISO]	PA11	SERCOM0 PAD[3] SPI MISO	
18 [SPI_SCK]	PA05	SERCOM0 PAD[1] SPI SCK	
19 [GND]	-	-	Ground.
20 [VCC]	-	-	Power for extension board.

Table 4-2. Extension Header EXT3

EXT1 pin	SAMHA1 pin	Function	Shared functionality
1 [ID]	-	-	Communication line to the ID chip on an extension board.
2 [GND]	-	-	Ground.
3 [ADC(+)]	PA06	AIN[6]	
4 [ADC(-)]	PA07	AIN[7]	
5 [GPIO1]	PA00	LED0	
6 [GPIO2]	PA01	GPIO	DGI_GPIO3
7 [PWM(+)]	PA14	TC3/WO[0]	
8 [PWM(-)]	PA15	TC3/WO[1]	
9 [IRQ/GPIO]	PB16	IRQ0/GPIO	DGI_GPIO1
10 [SPI_SS_B/GPIO]	PB17	GPIO	DGI_GPIO2
11 [TWI_SDA]	PA08	SERCOM2 PAD[0] I^2C SDA	
12 [TWI_SCL]	PA09	SERCOM2 PAD[1] I^2C SCL	EDBG I^2C
13 [USART_RX]	PA28	SERCOM1 PAD[1] UART RX	EDBG CDC UART RX
14 [USART_TX]	PA27	SERCOM1 PAD[0] UART TX	EDBG CDC UART TX
15 [SPI_SS_A]	PA20	SPI Master SS	
16 [SPI_MOSI]	PA21	SERCOM3 PAD[3] SPI MOSI	DGI_SPI_MOSI
17 [SPI_MISO]	PA16	SERCOM3 PAD[0] SPI MISO	
18 [SPI_SCK]	PA17	SERCOM3 PAD[1] SPI SCK	
19 [GND]	-	-	Ground.
20 [VCC]	-	-	Power for extension board.

Table 4-3. Extension Header HV

HV pin	SAMHA1 pin	Function	Shared functionality
1 [ID]	-	-	Communication line to the ID chip on an extension board.
2 [GND]	-	-	Ground.
3 -	-	-	
4 -	-	-	
5 [LIN_GND]	GND	-	Ground.
6 -	-	-	
7 [LIN]	LIN	LIN Bus	

HV pin	SAMHA1 pin	Function	Shared functionality
8 -	-	-	
9 [VS_LIN]	VS	Supply Voltage	
10 -	-	-	
11 [GND]	GND	-	Ground.
12 -	-	-	
13 -	-	-	
14 -	-	-	
15 -	-	-	
16 -	-	-	
17 -	-	-	
18 -	-	-	
19 [GND]	-	-	Ground.
20 [VCC]	-	-	Power for extension board.

4.1.2. Current Measurement Header

An angled 1x2, 100mil pin-header marked with MCU current measurement is located at the upper edge of the SAMHA1G16A Xplained Pro. All power to the ATSAMHA1G16A 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 ATSAMHA1G16A to be powered through its I/O pins. This may cause permanent damage to the device.

4.1.3. VCC_SEL Header

A 1x3, 100mil pin-header marked with MCU VCC SEL header is located at the upper left side of the SAM HA1G16A Xplained Pro. The power source for the ATSAMHA1G16A and extension boards is selected with this header.

Table 4-4. MCU VCC SEL header

Jumper position	Power source	Comment
VCC_LINTRX_P3V3 - VCC_TARGET	LIN SBC	The LIN SBC supplies the microcontroller and the extension boards. For this setting to work, the SBC must be supplied as described in chapter Power Sources. The voltage regulator inside the SBC is specified for max 85mA. If extension boards with high current consumption are attached, this setting should not be used.
VCC_P3V3 - VCC_TARGET	500mA voltage Regulator	The on board 500mA voltage regulator supplies the microcontroller and extension boards.

4.1.4. Cortex Debug Connector

SAMHA1G16A Xplained Pro has a 10-pin 50-mil Cortex ® Debug Connector that can be used to attach external debuggers to the ATSAMHA1G16A.

Table 4-5. Cortex Debug Connector

Cortex Debug Connector pin	Pin / Net	Function
1	VCC_TARGET_P3V3	ATSAMHA1G16A 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

4.2. Peripherals

4.2.1. Mechanical buttons

SAMHA1G16A Xplained Pro contains two mechanical buttons. One button is the RESET button connected to the SAMHA1 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.

Note: There is no pull-up resistor connected to the generic user button. Remember to enable the internal pull-up in the SAMHA1 to use the button.

Table 4-6. Mechanical Buttons

SAMHA1 pin	Silkscreen text
RESET	RESET
PB03	SW0

4.2.2. LED

There is one yellow LED available on the SAMHA1G16A Xplained Pro board that can be turned on and off. The LED can be activated by driving the connected I/O line to GND.

Table 4-7. LED Connection

SAMHA1 pin	Function	Comment
PA00	Yellow LED0	Pin shares function with EXT1

4.2.3. LIN SBC

The LIN SBC inside the SAMHA1 has external connections to headers and the microcontroller inside the SAMHA1. The LIN-SBC can be switched into different modes using the EN-Pin. The EN-Pin can be connected to a microcontroller portpin or fixed to VCC.

Table 4-8. EN SEL Header

Mode	Setting	Comment
Determined by Microcontroller	PB22 - SBC_EN	PB22 controls the mode of the SBC. During startup SBC stays in failsafe due to PB22 being in tri-state and EN pin having a pull-down resistor.
Always normal mode	VCC - SBC_EN	SBC goes into normal mode after startup. Mode can't be controlled by the microcontroller
Always fail-safe	Open	The internal pull-down resistor keeps the SBC in fail-safe mode. Useful when no LIN-communication is needed but the SBC is used to supply the board

Table 4-9. LIN-Transceiver connections

Microcontroller pin	LIN-TRX pin	MUX Setting
PB30	TXD	SERCOM[5]-PAD[0], MUX: D
PB23	RXD	SERCOM[5]-PAD[3], MUX: D

Table 4-10. RES SEL Header

Header pin	SAMHA1 pin	Comment
1 [NRES]	LIN-SBC NRES output	Connect to enable resetting of the microcontroller by the LIN SBC. Possible sources are VS undervoltage and others, listed in the ATSAMHA1G16A datasheet.
2 [RESETN]	Microcontroller Reset Input	

4.3. Embedded Debugger Implementation

SAMHA1G16A Xplained Pro contains an Embedded Debugger (EDBG) that can be used to program and debug the ATSAMHA1G16A using Serial Wire Debug (SWD). The Embedded Debugger also includes a Virtual Com port interface over UART, an Atmel Data Gateway Interface over I^2C and SPI and it includes four of the SAM HA1 GPIOs. Atmel Studio can be used as a front end for the Embedded Debugger.

4.3.1. Serial Wire Debug

The Serial Wire Debug (SWD) uses 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 4-11. SWD Connections

SAM HA1 pin	Function
PA30	SWD clock
PA31	SWD data

4.3.2. Virtual COM Port

The Embedded Debugger acts as a Virtual Com Port gateway by using one of the ATSAMHA1G16A UARTs. For further information on how to use the Virtual COM port, see Embedded Debugger.

Table 4-12. Virtual COM Port Connections

SAM HA1 pin	Function
PA27	SERCOM1 PAD[0] UART TXD (SAM HA1 TX line)
PA28	SERCOM1 PAD[1] UART RXD (SAM HA1 RX line)

4.3.3. Atmel Data Gateway Interface

The Embedded Debugger features an Atmel Data Gateway Interface (DGI) by using either an SPI or I²C. The DGI can be used to send a variety of data from the ATSAMHA1G16A to the host PC. For further information on how to use the DGI interface, see Atmel Data Visualizer and the EDBG User Guide.

Table 4-13. DGI Interface Connections when using SPI

SAM HA1 pin	Function	Shared functionality
PA18	Slave select (SAM HA1 is Master)	EXT1
PA17	SERCOM3 PAD[1] SPI SCK (Serial Clock)	EXT1, EXT3
PA16	SERCOM3 PAD[2] SPI MISO (Master In, Slave Out)	EXT1, EXT3
PA21	SERCOM3 PAD[3] SPI MOSI (Master Out, Slave In)	EXT3

Table 4-14. DGI Interface Connections when using I^2C

SAMHA1 pin	Function	Shared functionality
PA08	SERCOM2 PAD[0] SDA (Data line)	EXT1, EXT3
PA09	SERCOM2 PAD[1] SCL (Clock line)	EXT1, EXT3

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 SAMHA1 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 4-15. GPIO Lines Connected to the EDBG

SAMHA1 pin	Function	Shared functionality
PB03	GPIO0	SW0
PB16	GPIO1	EXT3
PB17	GPIO2	EXT3
PA01	GPIO3	EXT3

5. Hardware Revision History and Known Issues

5.1. 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 SAMHA1G16A Xplained Pro is A09-2482.

5.2. Revision 3

Revision 3 is the initially released revision, there are no known issues.

6. SAMHA1G16A Xplained Pro Revision History

Doc. rev.	Date	Comment
A	01/2016	Initial release

7. Evaluation Board/kit Important Notice

This evaluation board/kit is intended for use for **FURTHER ENGINEERING, DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY.** It is not a finished product and may not (yet) comply with some or any technical or legal requirements that are applicable to finished products, including, without limitation, directives regarding electromagnetic compatibility, recycling (WEEE), FCC, CE or UL (except as may be otherwise noted on the board/kit). Atmel supplied this board/kit "AS IS," without any warranties, with all faults, at the buyer's and further users' sole risk. The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies Atmel from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge and any other technical or legal concerns.

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USA

8. FCC_note

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

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