



SAM HA1G17A Xplained Pro

ATSAMHA1G17A XPRO User Guide

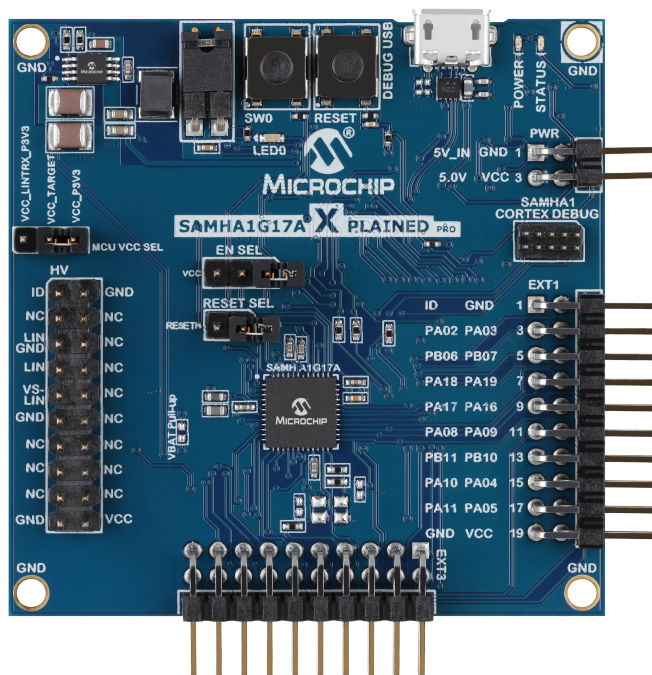
Product Overview

The SAM HA1G17A Xplained Pro Evaluation Kit is a hardware platform that is used to evaluate the ATSAMHA1G17A-B microcontroller.

Supported by the Microchip Studio integrated development platform, the kit provides easy access to the features of the ATSAMHA1G17A-B and explains how to integrate the device in a custom design.

The Xplained Pro MCU series evaluation kits include an on-board embedded debugger. No external tools are necessary to program or debug the ATSAMHA1G17A-B.

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



Features

- ATSAMHA1G17A-B 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

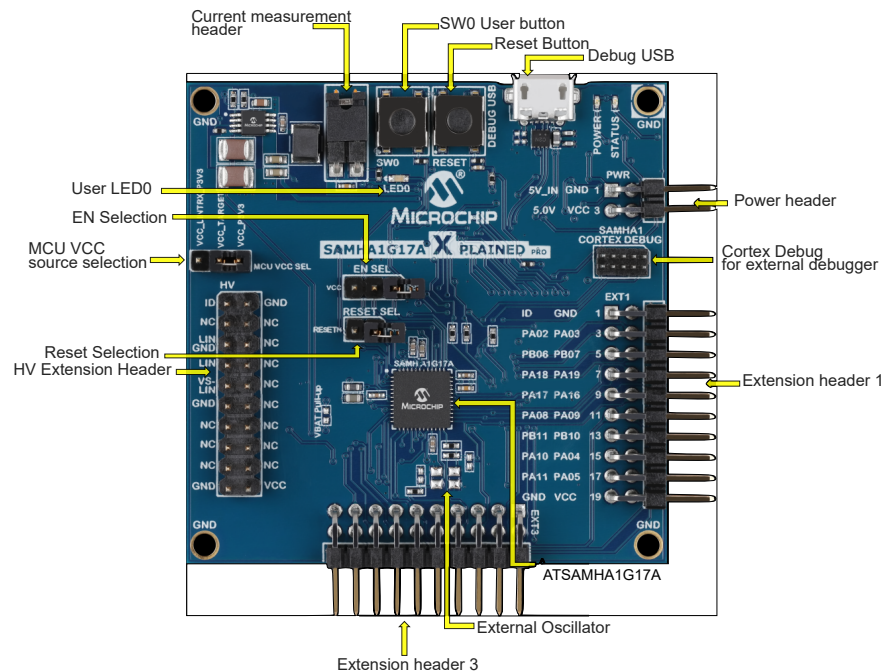
- Auto-ID for board identification in Atmel Studio
- One yellow status LED
- One green board power LED
- Programming and debugging
- Data Gateway Interface: I²C, SPI and four GPIOs
- Virtual COM port (CDC)
- USB Powered

What Is the SAM HA1G17A Xplained Pro Evaluation Kit?

The SAM HA1G17A Xplained Pro Evaluation Kit is a hardware platform that is used to evaluate the ATSAMHA1G17A-B.

The kit offers a set of features that enables the ATSAMHA1G17A-B user to get started with the SAM HA1 peripherals right away and to get an understanding of how to integrate the device in their design.

Figure 1. SAM HA1G17A Xplained Pro Evaluation Kit Overview



Contents of the SAM HA1G17A Xplained Pro Evaluation Kit

This SAM HA1G17A Xplained Pro Evaluation Kit includes:

- SAM HA1G17A Xplained Pro Evaluation Board
- Important Information Sheet

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1. Getting Started

1.1 Xplained Pro Quick Start

Steps to start exploring the Xplained Pro platform:

1. Download and install either the Microchip Studio for AVR® and SAM Devices or the Microchip MPLAB® X Integrated Development Environment (IDE).
2. Launch whichever of the above application you downloaded and installed.
3. Connect the Debug USB port on the evaluation kit to the computer 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, the operating system installs the driver software automatically. This driver supports 32-bit and 64-bit versions of Microsoft® Windows® XP, Windows Vista®, Windows 7, Windows 8, Windows 10, and Windows Server 2012.

When the Xplained Pro MCU board is powered, the power LED (green) glows, and Microchip Studio/MPLAB® X automatically detects the specific Xplained Pro MCU and extension board(s) that are connected. The landing page of the kit in the Microchip Studio has an option to launch the Advanced Software Framework (ASF) and the Atmel START example application codes 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 required.

1.2 SAM HA1G17A Xplained Pro Design Documentation and relevant links

The following list contains links to the most relevant documents and software for the SAM HA1G17A Xplained Pro.

- **Xplained Products** - Xplained Evaluation Kits are a series of easy-to-use evaluation kits for Microchip microcontrollers and other Microchip products.
 - Xplained Nano - used for low pin count devices and provides a minimalistic solution with access to all I/O pins of the target microcontroller.
 - Xplained Mini - used for medium pin count devices and adds Arduino Uno compatible header footprint and a prototyping area.
 - Xplained Pro - used for medium-to-high pin count devices that feature advanced debugging and standardized extensions for peripheral functions.

Note: All the above kits have on-board programmers/debuggers, which create a set of low-cost boards for evaluation and demonstration of features and capabilities of different Microchip products.

- **Microchip Studio** - Free IDE for the development of C/C++ and assembler code for microcontrollers.
- **MPLAB® X IDE** - Free IDE for the development of applications for microchip microcontrollers and digital signal controllers.
- **Microchip Sample Store** - Microchip 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 16 KB for devices with M0, M0+, and M1 cores and 32 KB for devices with other cores.
- **QTouch® Tools** - A collection of tools to design capacitive touch applications.
- **MPLAB Data Visualizer** - MPLAB Data Visualizer is a program used for processing and visualizing data. The Data Visualizer can receive data from various sources such as serial ports and on-board debugger's Data Gateway Interface, as found on Curiosity Nano and Xplained Pro boards.
- **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 HA1G17A Xplained Pro in the Microchip store** - Microchip Store link.

2. Xplained Pro

Xplained Pro is an evaluation platform containing a series of microcontroller boards (evaluation kits) and extension boards. Microchip Studio/MPLAB® X is used to program and debug the microcontrollers on these boards. Microchip Studio includes Advanced Software Framework (ASF) and Atmel START which has drivers, demo code, and Data Visualizer that supports data streaming and advanced debugging. Xplained Pro evaluation kits can be connected to a wide range of Xplained Pro extension boards through standardized headers and connectors. Xplained Pro extension boards have identification (ID) chips to uniquely identify which boards are connected to the Xplained Pro evaluation kits.

2.1 Embedded Debugger

The SAM HA1G17A Xplained Pro contains an Embedded Debugger (EDBG) for on-board debugging. The EDBG is a USB composite device with the following interfaces:

- Debugger
- Virtual COM Port (CDC)
- Data Gateway Interface (DGI)

The EDBG can program and debug the ATSAMHA1G17A-B with the help of Microchip Studio/MPLAB® X. The SWD interface is connected between the EDBG and the ATSAMHA1G17A-B on the SAM HA1G17A Xplained Pro.

The Virtual COM Port is connected to a UART on the ATSAMHA1G17A-B and provides an easy way to communicate with the target application through terminal software. It offers variable baud rate, parity, and stop bit settings. The settings on the ATSAMHA1G17A-B 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 ATSAMHA1G17A-B. If the DTR signal is not enabled, the UART pins on the EDBG are kept in tri-state (high-Z) to render the COM Port not usable. The DTR signal is automatically set by terminal software, but it may have to be manually enabled in the terminal.

The DGI consists of several physical interfaces for bidirectional communication with the host computer. Communication over the interfaces is bidirectional. It can be used to send event values and data from the ATSAMHA1G17A-B. Traffic over the interfaces can be timestamped by the EDBG for more accurate tracking of events, but timestamping reduces the maximal data throughput. The [Studio Data Visualizer](#) is used to send and receive data through DGI.

The EDBG controls two LEDs on the SAM HA1G17A Xplained Pro: a power LED and a status LED. The following table provides details on how the LEDs are controlled in different operation modes.

Table 2-1. EDBG LED Control

Mode	Power LED	Status LED
Normal mode	The power LED is ON when power is applied to the board.	Activity indicator, the LED flashes when any communication happens to the EDBG.
Bootloader mode (idle)	The power LED and the status LED blink simultaneously.	
Bootloader mode (firmware upgrade)	The power LED and the status LED blink in an alternating pattern.	

For additional information on the EDBG, see the [EDBG User Guide](#).

2.2 Hardware Identification System

All Xplained Pro extension boards come with an identification chip (ATSHA204A CryptoAuthentication™ chip) to uniquely identify the boards that are connected to the Xplained Pro Evaluation Kit. This chip contains information that identifies the extension with its name and some extra data. When an Xplained Pro extension is connected to an Xplained Pro Evaluation Kit, the information is read and sent to the Microchip Studio/MPLAB® X. The following table shows the data fields stored in the ID chip with example content.

Table 2-2. Xplained Pro ID Chip Content

Data Field	Data Type	Example Content
Manufacturer	ASCII string	Microchip\0'
Product name	ASCII string	Segment LCD1 Xplained Pro\0'
Product revision	ASCII string	02\0'
Product serial number	ASCII string	1774020200000010\0'
Minimum voltage [mV]	uint16_t	3000
Maximum voltage [mV]	uint16_t	3600
Maximum current [mA]	uint16_t	30

2.3 Power Sources

The SAM HA1G17A Xplained Pro kit can be powered by several power sources, as listed in the following table.

Table 2-3. Power Sources for SAM HA1G17A Xplained Pro

Power Source	Voltage Requirements	Current Requirements	Connector Marking
External power	5V \pm 2% (\pm 100 mV) for USB host operation. 4.3V to 5.5V if a USB host operation is not required.	The recommended value for the maximum current is 2A	PWR
Embedded debugger USB	4.4V to 5.25V (according to USB specification)	500 mA (according to USB specification)	DEBUG USB
External HV input	6V to 28V	Voltage regulator in SBC is specified for up to 85 mA. This input also supplies the LIN bus and all the other features of the SBC. It is recommended to use a Power supply that can supply at least 500 mA.	VS and GND on Connector HV

The kit automatically detects the available power sources and chooses which 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 500 mA from a USB connector is not enough to power the board with possible extension boards.

2.4 Xplained Pro Headers and Connectors

2.4.1 Xplained Pro Standard Extension Header

All Xplained Pro kits have many dual-row, 20-pin, 100 mil extension headers. The Xplained Pro MCU boards have male headers, while the Xplained Pro extensions have their female counterparts. The following table provides the pin description of all the connected pins.



Info: Not all pins are always connected to all extension headers.

The extension headers can be used to connect a variety of Xplained Pro extensions to Xplained Pro MCU boards or to access the pins of the target microcontroller on the Xplained Pro boards.

Table 2-4. Xplained Pro Standard Extension Header

Pin Number	Pin Name	Description
1	ID	Pin to communicate with the ID chip on an extension board.
2	GND	Ground.
3	ADC(+)	Analog-to-Digital Converter; alternatively, a pin for the positive terminal of a differential ADC.
4	ADC(-)	Analog-to-Digital Converter; alternatively, a pin for the negative terminal of a differential ADC.
5	GPIO1	General purpose I/O pin.
6	GPIO2	General purpose I/O pin.
7	PWM(+)	Pulse-Width Modulation; alternatively, a pin for the positive part of a differential PWM.
8	PWM(-)	Pulse-Width Modulation; alternatively, a pin for the negative part of a differential PWM.
9	IRQ/GPIO	Interrupt request pin and/or general purpose I/O pin.
10	SPI_SS_B/GPIO	Client select pin for Serial Peripheral Interface (SPI) and/or general purpose I/O pin.
11	I ² C_SDA	Data pin for I ² C interface. Always connected, bus type.
12	I ² C_SCL	Clock pin for I ² C interface. Always connected, bus type.
13	UART_RX	Receiver pin of target device UART.
14	UART_TX	Transmitter pin of target device UART.
15	SPI_SS_A	Client select for SPI. This pin should preferably not be connected to anything else.

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Pin Number	Pin Name	Description
16	SPI_MOSI	SPI host out, client in pin. Always connected, bus type.
17	SPI_MISO	SPI host in, client out pin. Always connected, bus type.
18	SPI_SCK	SPI clock pin. Always connected, bus type.
19	GND	Ground pin for extension boards.
20	VCC	Power pin for extension boards.

2.4.2 Xplained Pro Power Header

The power header can be used to connect external power to the SAM HA1G17A Xplained Pro kit. The kit automatically detects and switches to an external power source, if supplied. The power header can also be used to supply power to external peripherals or extension boards. Ensure that the total current does not exceed the recommended current limit of the on-board regulator when using the 3.3V pin.

Table 2-5. Xplained Pro Power Header

Pin Number	Pin Name	Description
1	VEXT_P5V0	External 5V input pin
2	GND	Ground pin
3	VCC_P5V0	Unregulated 5V pin (an output, derived from one of the input sources)
4	VCC_P3V3	Regulated 3.3V pin (an output, used as the main power supply for the kit)

2.4.3 Xplained Pro HV Header

This Xplained Pro kit has one, 20-pin, 100 mil HV-extension header. Note that all pins are not always connected. All connected pins follow the defined pinout description in the table below.

Table 2-6. Xplained Pro HV Extension Header

Pin Number	Name	Description
1	ID	Communication line to the ID chip on an extension board
2	GND	Ground
3	NC	
4	NC	
5	LIN_GND	GND of LIN SBC
6	NC	
7	LIN	LIN-Bus signal
8	NC	
9	VS	Battery voltage VS
10	NC	
11	GND	GND
12	NC	
13	NC	

SAM HA1G17A Xplained Pro

Xplained Pro

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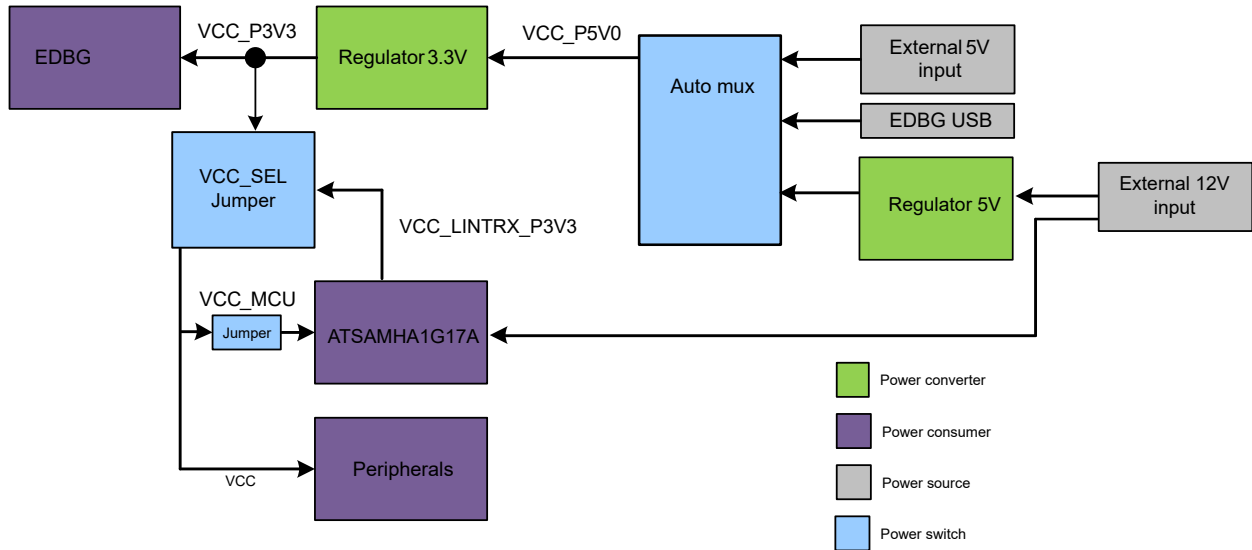
Pin Number	Name	Description
14	NC	
15	NC	
16	NC	
17	NC	
18	NC	
19	GND	Ground
20	VCC	Power for extension board

3. Hardware Description

3.1 Power Distribution

SAM HA1G17A Xplained Pro has two power sources: EDBG USB and external 5.0V. The kit will automatically select the source to draw power from. The kit has two on-board 3.3V voltage regulators: one for the EDBG, and one for the ATSAMHA1G17A-B and other peripherals.

Figure 3-1. Power Supply Block Diagram



3.2 Connectors

This chapter describes the implementation of the relevant connectors and headers on SAM HA1G17A Xplained Pro and their connection to the ATSAMHA1G17A-B. The tables of connections in this chapter also describe which signals are shared between the headers and on-board functionality.

3.2.1 Xplained Pro Extension Headers

The SAM HA1G17A 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 2-4](#). The header has a pitch of 2.54mm.

Table 3-1. Extension Header EXT1

EXT1 Pin	SAM HA1 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	

SAM HA1G17A Xplained Pro

Hardware Description

.....continued			
EXT1 Pin	SAM HA1 Pin	Function	Shared Functionality
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 ² C SDA	EDBG I ² C
12 [TWI_SCL]	PA09	SERCOM2 PAD[1] I ² C SCL	EDBG I ² C
13 [USART_RX]	PB11	SERCOM4 PAD[3] UART RX	
14 [USART_TX]	PA10	SERCOM4 PAD[2] UART TX	
15 [SPI_SS_A]	PA10	SPI Chipselect	
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 3-2. Extension Header EXT3

EXT1 Pin	SAM HA1 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 ² C SDA	
12 [TWI_SCL]	PA09	SERCOM2 PAD[1] I ² C SCL	EDBG I ² C
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 Chipselect	
16 [SPI_MOSI]	PA21	SERCOM3 PAD[3] SPI MOSI	DGI_SPI_MOSI
17 [SPI_MISO]	PA16	SERCOM3 PAD[0] SPI MISO	

SAM HA1G17A Xplained Pro

Hardware Description

.....continued

EXT1 Pin	SAM HA1 Pin	Function	Shared Functionality
18 [SPI_SCK]	PA17	SERCOM3 PAD[1] SPI SCK	
19 [GND]	-	-	Ground.
20 [VCC]	-	-	Power for extension board.

Table 3-3. Extension Header HV

HV Pin	SAM HA1 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	
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.

3.2.2 Current Measurement Header

A right-angled 1x2, 100 mil pin header marked with the MCU current measurement is located at the upper edge of the SAM HA1G17A Xplained Pro. All power to the ATSAMHA1G17A-B is exclusively routed through this header (excluding power to extension headers and peripherals). 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 ATSAMHA1G17A-B to be powered through its I/O pins. This may cause permanent damage to the device.

3.2.3 VCC_SEL Header

A 1x3, 100 mil pin header marked with "MCU VCC SEL" is located at the upper-left side of the SAM HA1G17A Xplained Pro. The power source for the ATSAMHA1G17A-B and extension boards is selected with this header.

Table 3-4. 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 2.3 Power Sources . The voltage regulator inside the SBC is specified for max 85 mA. If extension boards with high current consumption are attached, this setting should not be used.
VCC_P3V3 - VCC_TARGET	500 mA Voltage Regulator	The on-board 500 mA voltage regulator supplies the microcontroller and extension boards.

3.2.4 Cortex Debug Connector

SAM HA1G17A Xplained Pro has a 10-pin 50 mil Cortex® Debug Connector that can be used to attach an external debugger to the ATSAMHA1G17A-B.

Table 3-5. Cortex Debug Connector

Cortex Debug Connector Pin	Pin / Net	Function
1	VCC_TARGET_P3V3	ATSAMHA1G17A-B 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

3.3 Peripherals

3.3.1 Mechanical Buttons

SAM HA1G17A Xplained Pro contains two mechanical buttons. One is the RESET button, connected to the SAM HA1 reset line, and the other is a generic user configurable button. When a button is pressed it drives 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 SAM HA1 to use the button.

Table 3-6. Mechanical Buttons

SAM HA1 Pin	Silkscreen Text
RESET	RESET
PB03	SW0

3.3.2 LED

There is one yellow LED available on the SAM HA1G17A 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 3-7. LED Connection

SAM HA1 Pin	Function	Comment
PA00	Yellow LED0	Pin is shared with EXT1

3.3.3 LIN SBC

The LIN SBC inside the SAM HA1 has external connections to headers and the microcontroller inside the SAM HA1. The LIN-SBC can be switched into different modes using the EN pin. The EN pin can be connected to a microcontroller port pin or fixed to VCC.

Table 3-8. EN SEL Header

Mode	Setting	Comment
Determined by Microcontroller	PB22 - SBC_EN	PB22 controls the mode of the SBC. During start-up, SBC stays in Fail-Safe mode, due to PB22 being in tri-state and the EN pin having a pull-down resistor.
Always Normal mode	VCC - SBC_EN	SBC goes into Normal mode after start-up. Mode cannot be controlled by the microcontroller.
Always Fail-Safe mode	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 3-9. 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 3-10. RES SEL Header

Header Pin	SAM HA1 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 ATSAMHA1G17A-B data sheet.
2 [RESETN]	Microcontroller Reset input	

3.4 Embedded Debugger Implementation

SAM HA1G17A Xplained Pro contains an Embedded Debugger (EDBG) that can be used to program and debug the ATSAMHA1G17A-B using Serial Wire Debug (SWD). The EDBG also includes a Virtual Com port interface over UART and a Data Gateway Interface over I²C. It includes four of the SAM HA1 GPIOs. Atmel Studio can be used as a front end for the Embedded Debugger.

3.4.1 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 [2.1 Embedded Debugger](#).

Table 3-11. SWD Connections

SAM HA1 Pin	Function
PA30	SWD clock
PA31	SWD data

3.4.2 Virtual COM Port

The Embedded Debugger acts as a Virtual Com Port gateway by using one of the ATSAMHA1G17A-B UARTs. For further information on how to use the Virtual COM port, see [2.1 Embedded Debugger](#).

Table 3-12. 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)

3.4.3 Data Gateway Interface

The Embedded Debugger features a Data Gateway Interface (DGI) by using an I²C interface. The DGI can be used to send a variety of data from the ATSAMHA1G17A-B to the host PC. For further information on how to use the DGI interface, see [Studio Data Visualizer](#) and the [EDBG User Guide](#).

Table 3-13. DGI Interface Connections when using I²C

SAM HA1 Pin	Function	Shared Functionality
PA08	SERCOM2 PAD[0] SDA (Data line)	EXT1 , EXT3
PA09	SERCOM2 PAD[1] SCL (Clock line)	EXT1 , EXT3

Table 3-14. DGI Interface Connections when using SPI

SAM HA1 Pin	Function	Shared functionality
PA18	Chip select (SAM HA1 is Host)	EXT1
PA17	SERCOM3 PAD[1] SPI SCK (Serial Clock)	EXT1, EXT3
PA16	SERCOM3 PAD[2] SPI MISO (Host In, Client Out)	EXT1, EXT3
PA21	SERCOM3 PAD[3] SPI MOSI (Host Out, Client In)	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 SAM HA1 application code. For further information on how to configure and use the GPIO monitoring features, see [Studio Data Visualizer](#) and the [EDBG User Guide](#).

Table 3-15. GPIO Lines Connected to the EDBG

SAM HA1 Pin	Function	Shared Functionality
PB03	GPIO0	SW0
PB16	GPIO1	EXT3
PB17	GPIO2	EXT3
PA01	GPIO3	EXT3

4. Appendix

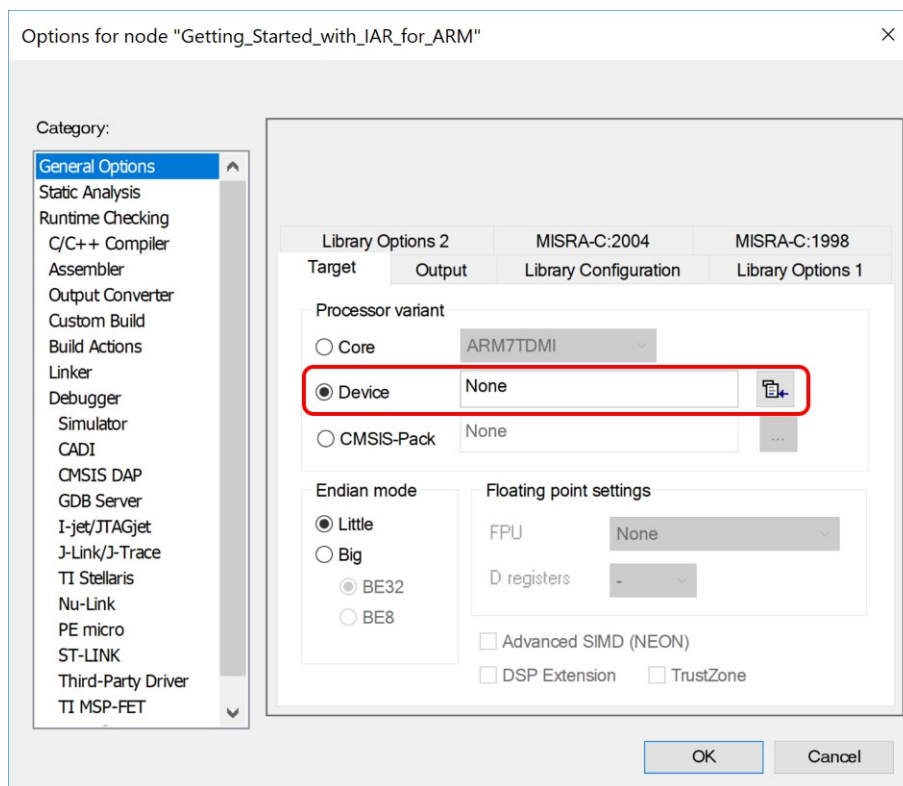
4.1 Getting Started with IAR

The IAR Embedded Workbench® for ARM® is a proprietary, high-efficiency compiler not based on GCC. The programming and debugging of SAM HA1G17A Xplained Pro is 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 programming and debugging to work.

The following steps explain how to set up a project for programming and debugging:

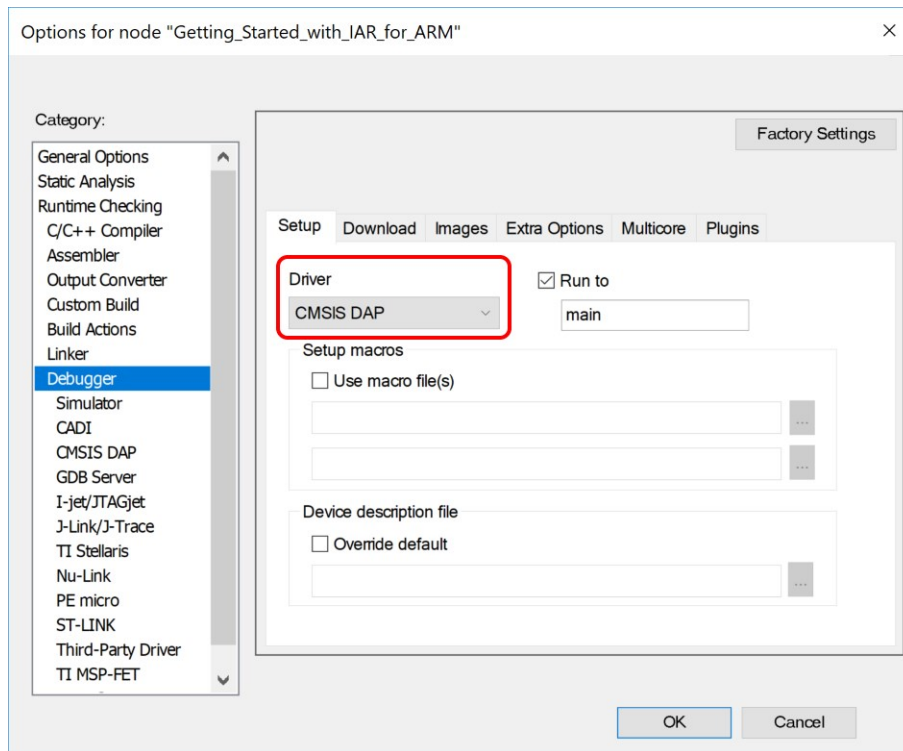
1. Open the project that needs to be configured. Open the **OPTIONS** dialog for the project.
2. In the **General Options** category, click the **Target** tab. [Select the "Device" for the project or the "Core" of the device.](#)

Figure 4-1. Select Target Device



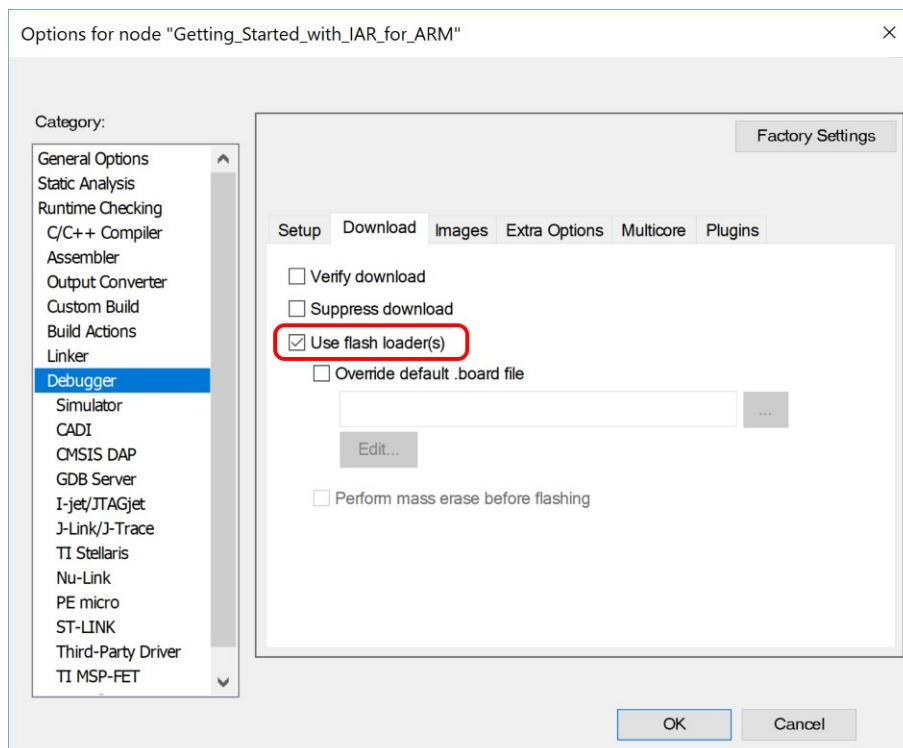
3. In the **Debugger** category, click the **Setup** tab. [Select CMSIS DAP as the driver.](#)

Figure 4-2. Select Debugger



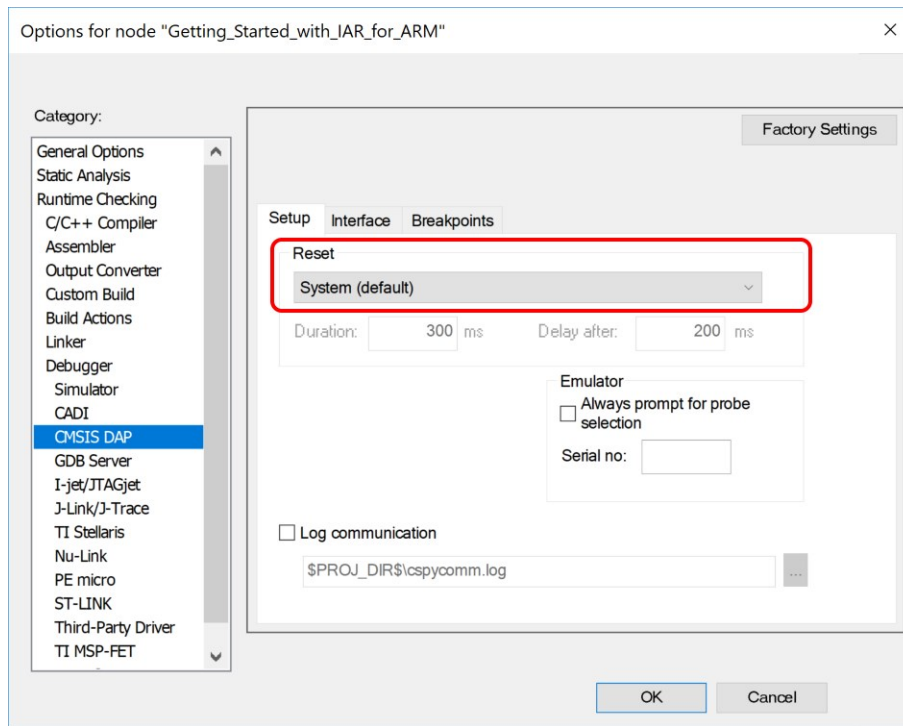
4. In the **Debugger** category, click the **Download** tab. Select the **Use flash loader(s)** option.

Figure 4-3. Configure Flash Loader



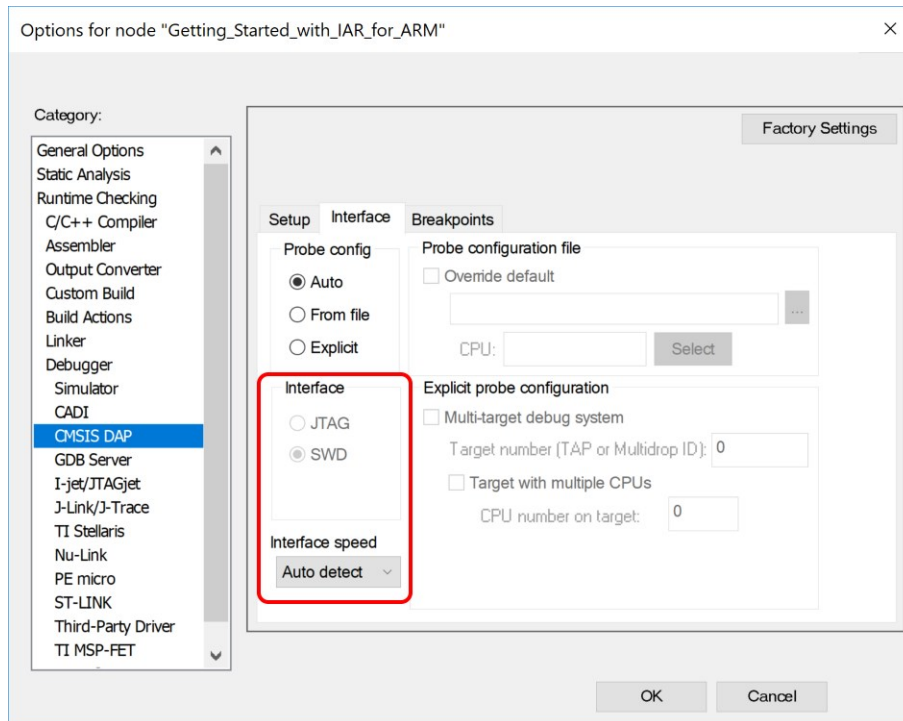
5. In the **Debugger** > **CMSIS DAP** category, select the **Setup** tab. Select **System (default)** as the reset method.

Figure 4-4. Configure Reset



6. In the category **Debugger** > **CMSIS DAP**, click the **JTAG/SWD** tab. Select **SWD** as the interface and optionally select the **SWD speed**.

Figure 4-5. Configure Interface



4.2 Connecting External Debuggers to an Xplained Pro Board

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

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

Table 4-1. Squid Cable Connections

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

Note:

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

Figure 4-6. SAM-ICE using a Squid Cable



Figure 4-7. SAM-ICE using an Atmel-ICE Adapter

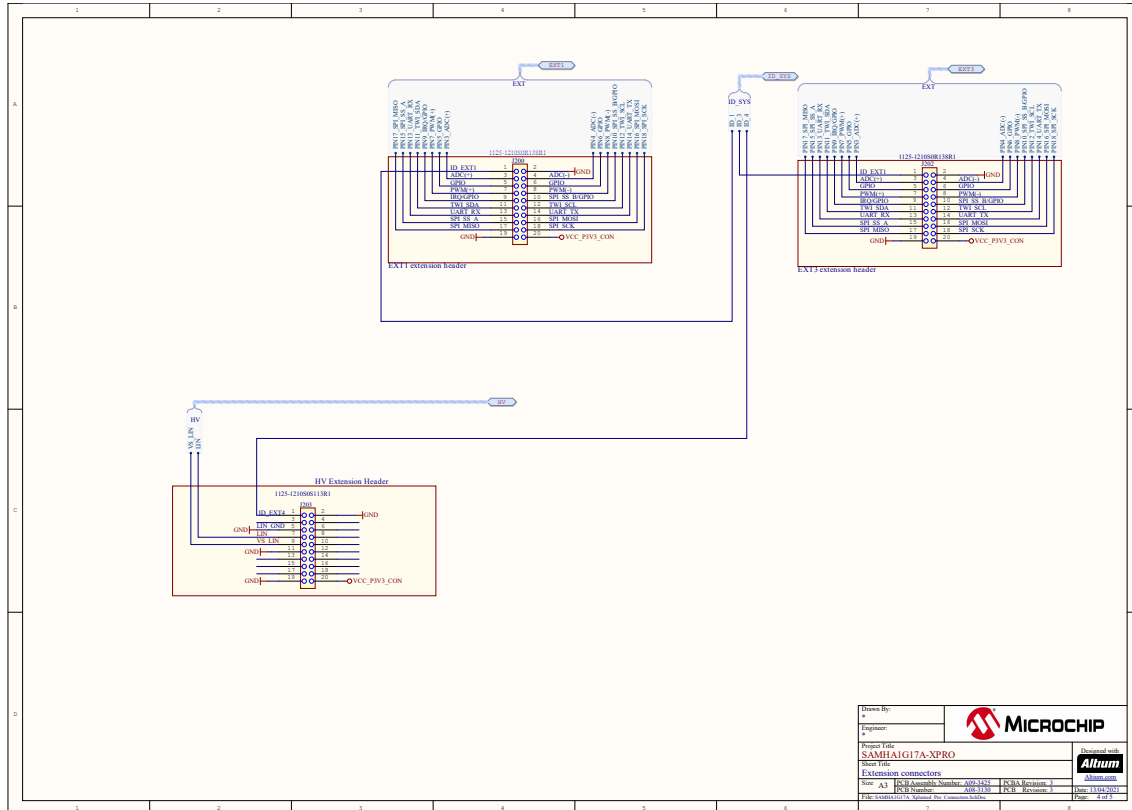
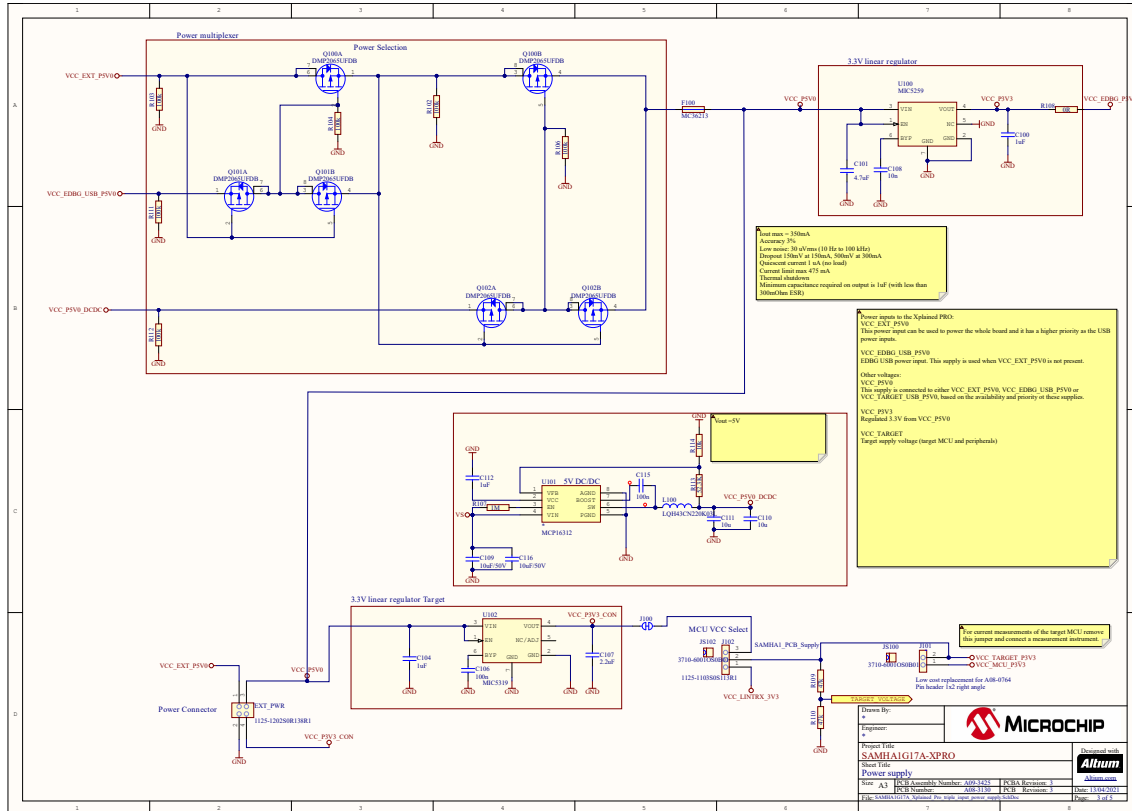


Note:

If contention with the on-board EDBG occurs, 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 0 Ω resistors, where available, or cutting the tracks to the EDBG can also be done.

SAM HA1G17A Xplained Pro

Appendix



Appendix

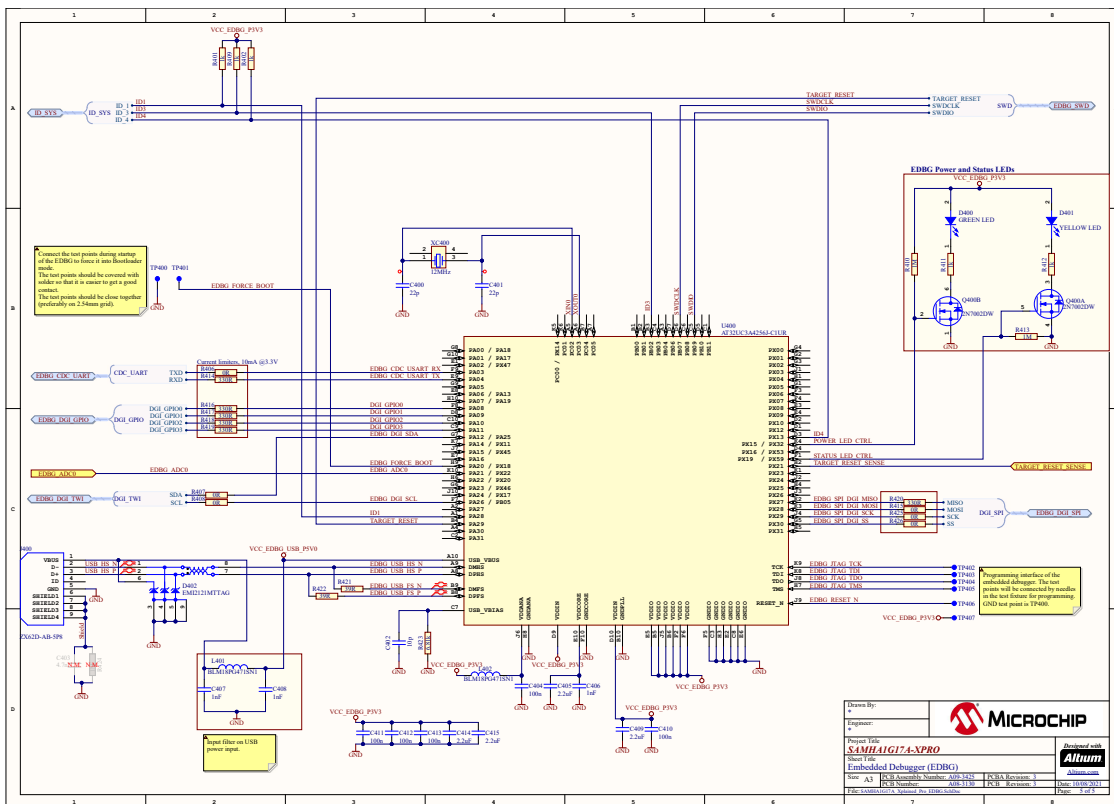
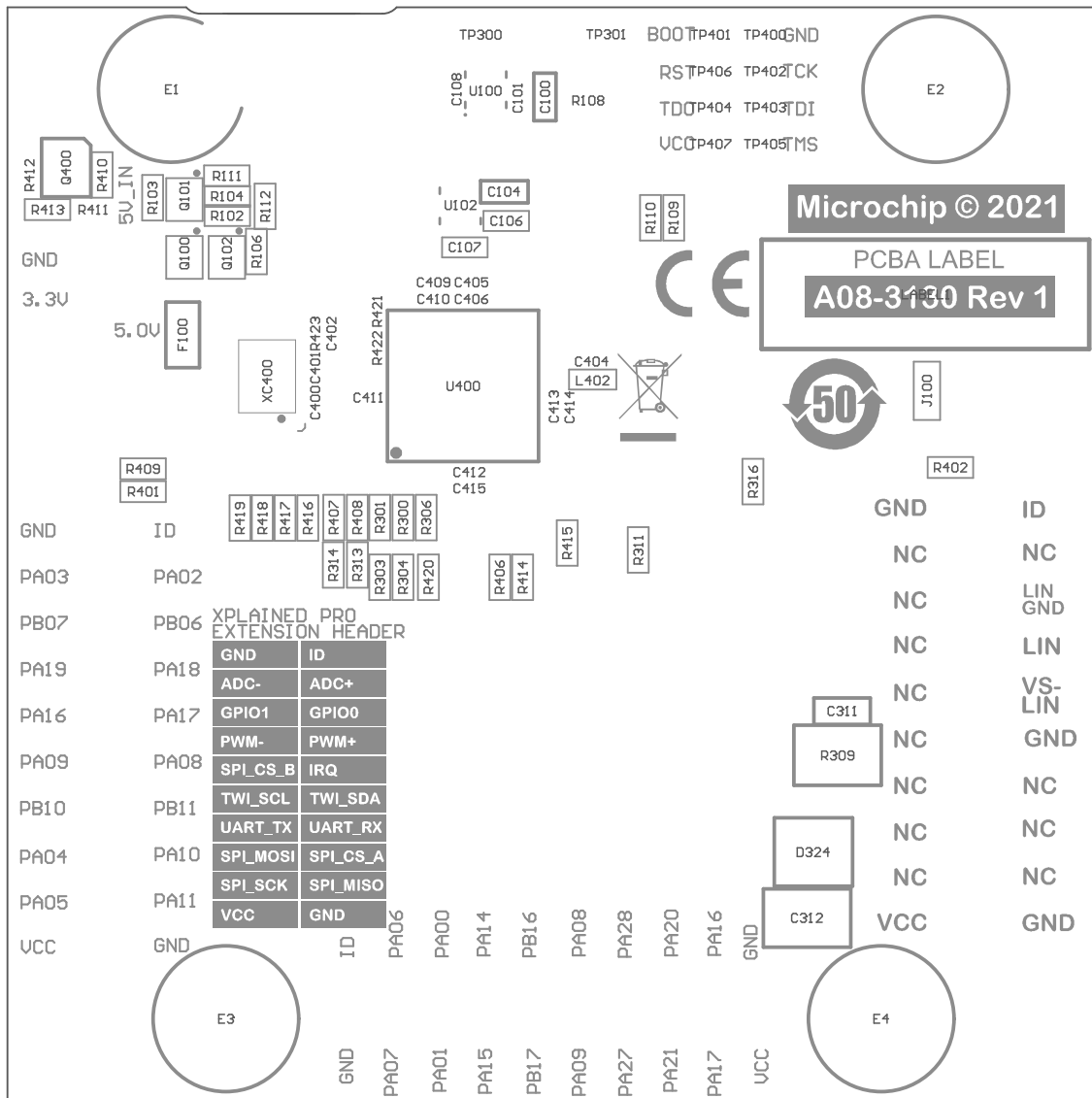


Figure 5-3. SAM HA1G17A Xplained Pro Assembly Drawing Bottom



6. Hardware Revision History and Known Issues

6.1 Identifying Product ID and Revision

There are two ways to find the revision and product identifier of the Xplained Pro boards: either through Microchip Studio/MPLAB® X or by looking at the sticker on the bottom side of the PCB.

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

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

The serial number string has the following format:

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

The product identifier for the SAM HA1G17A Xplained Pro is A09-3425.

6.2 Revision

Revision 2 is the initially released revision; there are no known issues.

7. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	Date	History
A	2021/08	Initial Release

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