AVR 8-bit Microcontrollers

XMEGA A1U Xplained Pro

USER GUIDE

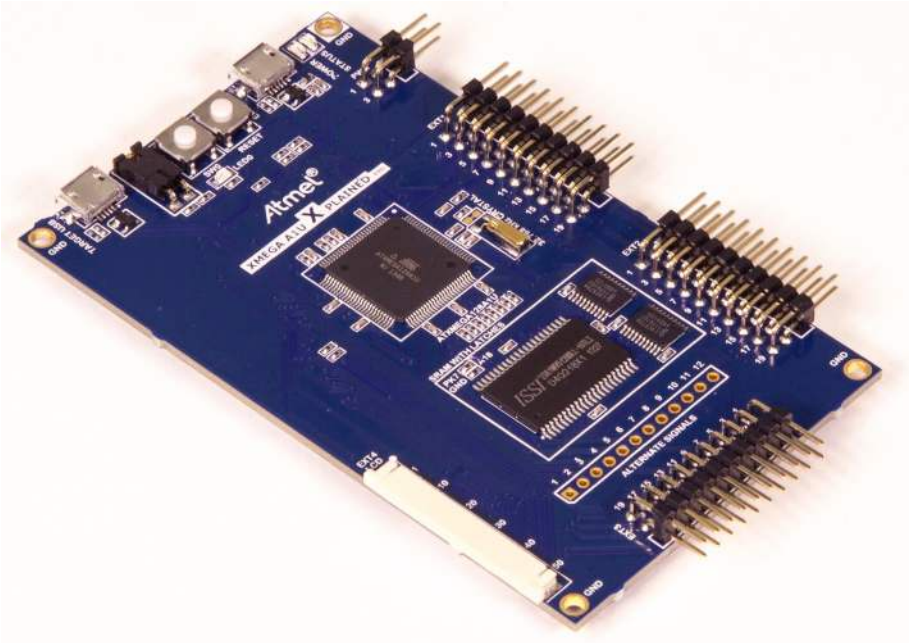
Preface

The Atmel® XMEGA® A1U Xplained Pro evaluation kit is a hardware platform to evaluate the ATxmega128A1U microcontroller.

Supported by the Atmel Studio integrated development platform, the kit provides easy access to the features of the Atmel ATxmega128A1U 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 ATxmega128A1U.

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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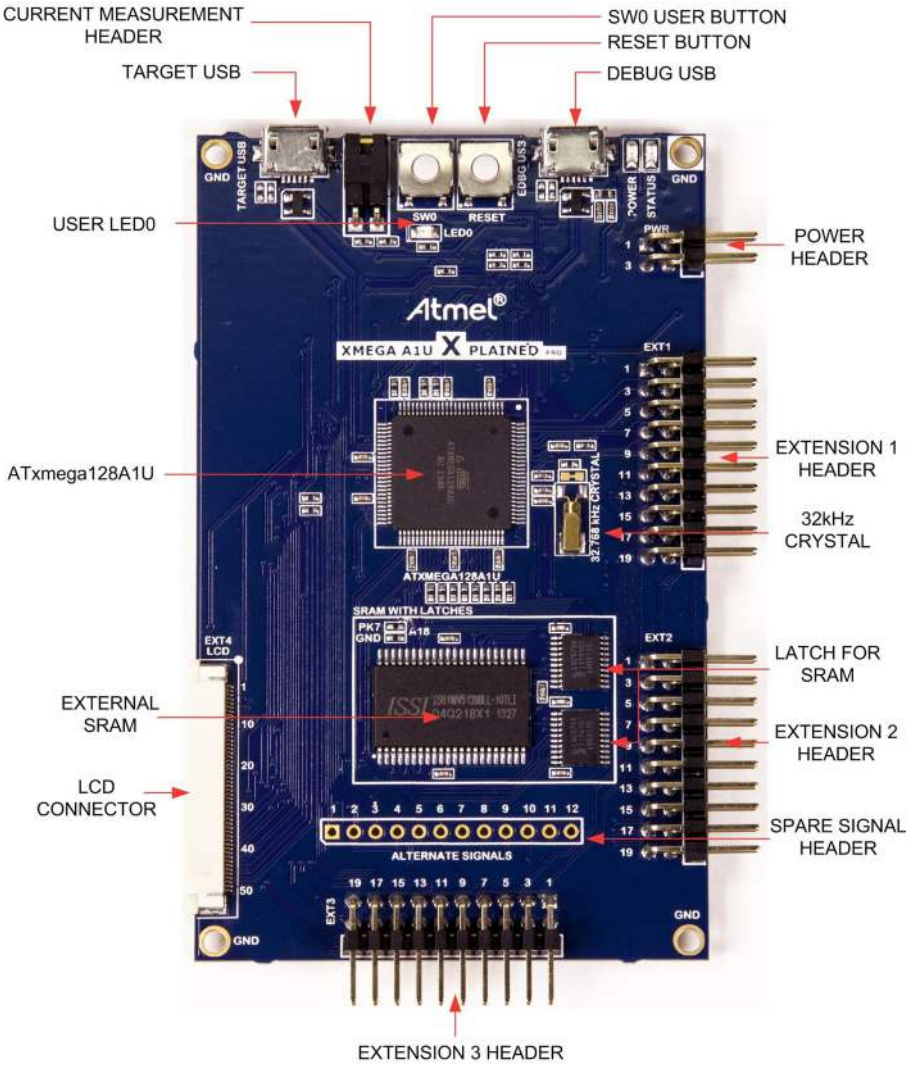
1.2. Kit Overview

The Atmel XMEGA A1U Xplained Pro evaluation kit is a hardware platform to evaluate the Atmel ATxmega128A1U.

The kit offers a set of features that enables the ATxmega128A1U user to get started using the XMEGA peripherals right away and to get an understanding of how to integrate the device in their own design.

Figure 1-1. XMEGA A1U 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 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 XMEGA A1U device is programmed and debugged by the on-board Embedded Debugger and therefore no external programmer or debugger tool is needed.

2.2. Design Documentation and Relevant Links

The following list contains links to the most relevant documents and software for the XMEGA A1U 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 Atmel AVR®** - This is a commercial C/C++ compiler that is available for 8-bit AVR. There is a 30 day evaluation version as well as a 4KB code size limited kick-start version available from their website.
- **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.

- **XMEGA A1U Xplained Pro on Atmel web page** - Atmel website 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 XMEGA A1U 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 ATxmega128A1U. On XMEGA A1U Xplained Pro, the PDI interface is connected between the EDBG and the ATxmega128A1U.

The Virtual COM Port is connected to a UART on the ATxmega128A1U 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 ATxmega128A1U 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 ATxmega128A1U. 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 ATxmega128A1U 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 XMEGA A1U 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 XMEGA A1U Xplained Pro kit can be powered by several power sources as listed in the table below.

Table 3-3. Power Sources for XMEGA A1U 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
Target USB	4.4V to 5.25V (according to USB spec.)	500mA (according to USB spec.)	TARGET 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.
3. Target USB.

Info: External power is required when 500mA from a USB connector is not enough to power the board with possible extension boards. A connected USB device in a USB host application might easily exceed this limit.

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

Pin number	Name	Description
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 LCD Extension Connector

The LCD connector provides the ability to connect to display extensions that have a parallel interface. The connector implements signals for a MCU parallel bus interface and a LCD controller interface as well as signals for a touch controller. The connector pin-out definition is shown in Table 3-5 Xplained Pro LCD Connector. Note that usually only one display interface is implemented, either the LCD controller or the MCU bus interface.

A FPC/FFC connector with 50 pins and 0.5mm pitch is used for the LCD connector. The connector XF2M-5015-1A from Omron is used on several Xplained Pro designs and can be used as a reference.

Table 3-5. Xplained Pro LCD Connector

Pin number	Name	RGB interface description	MCU interface description
1	ID	Communication line to the ID chip on an extension board	
2	GND	Ground	
3	D0	Data line	
4	D1	Data line	
5	D2	Data line	
6	D3	Data line	
7	GND	Ground	
8	D4	Data line	
9	D5	Data line	
10	D6	Data line	
11	D7	Data line	
12	GND	Ground	
13	D8	Data line	
14	D9	Data line	
15	D10	Data line	
16	D11	Data line	
17	GND	Ground	

Pin number	Name	RGB interface description	MCU interface description
18	D12	Data line	
19	D13	Data line	
20	D14	Data line	
21	D15	Data line	
22	GND	Ground	
23	D16	Data line	
24	D17	Data line	
25	D18	Data line	
26	D19	Data line	
27	GND	Ground	
28	D20	Data line	
29	D21	Data line	
30	D22	Data line	
31	D23	Data line	
32	GND	Ground	
33	PCLK / CMD DATA SEL	Pixel clock	Display RAM select. One address line of the MCU for displays where it is possible to select either register or data interface.
34	VSYNC / CS	Vertical Synchronization	Chip select
35	HSYNC / WE	Horizontal Synchronization	Write enable signal
36	DATA ENABLE / RE	Data enable signal	Read enable signal
37	SPI SCK	Clock for serial peripheral interface	
38	SPI MOSI	Master out slave in of serial peripheral interface	
39	SPI MISO	Master in slave out of serial peripheral interface	
40	SPI SS	Slave select for serial peripheral interface. Preferably a dedicated pin.	
41	ENABLE	Display enable	
42	I^2C SDA	I^2C data	
43	I^2C SCL	I^2C clock	
44	IRQ1	Interrupt 1	
45	IRQ2	Interrupt 2	
46	PWM	Backlight control	

Pin number	Name	RGB interface description	MCU interface description
47	RESET	Extension reset	
48	VCC	3.3V power supply for extension board	
49	VCC	3.3V power supply for extension board	
50	GND	Ground	

3.4.3. Xplained Pro Power Header

The power header can be used to connect external power to the XMEGA A1U 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 3-6. 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)

4. Hardware Users Guide

4.1. Connectors

This chapter describes the implementation of the relevant connectors and headers on XMEGA A1U Xplained Pro and their connection to the ATxmega128A1U. 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 Standard Extension Headers

The XMEGA A1U Xplained Pro headers EXT1, EXT2, and EXT3 offer access to the I/O of the microcontroller in order to expand the board e.g. by connecting extensions to the board. These headers all comply with the standard extension header specified in Xplained Pro Standard Extension Header. All headers have a pitch of 2.54mm.

Table 4-1. Extension Header EXT1

Pin on EXT1	XMEGA pin	Function	Shared functionality
1 [ID]	-	-	Communication line to ID chip on extension board
2 [GND]	-	-	GND
3 [ADC(+)]	PA0	ADCA0 (GAINPOS)	Alternate signal header
4 [ADC(-)]	PA4	ADCA4 (GAINNEG)	
5 [GPIO1]	PE6	GPIO	
6 [GPIO2]	PE7	GPIO	Alternate signal header
7 [PWM(+)]	PE1	TCC0 OC0B	
8 [PWM(-)]	PE0	TCC0 OC0A	
9 [IRQ/GPIO]	PR0	GPIO	
10 [SPI_SS_B/GPIO]	PR1	GPIO	
11 [TWI_SDA]	PC0	TWIC SDA	EDBG and LCD Connector
12 [TWI_SCL]	PC1	TWIC SCL	EDBG and LCD Connector
13 [USART_RX]	PC2	USARTC0 RXD0	
14 [USART_TX]	PC3	USARTC0 TXD0	
15 [SPI_SS_A]	PC4	SPIC SS	
16 [SPI_MOSI]	PC5	SPIC MOSI	EXT2, EXT3, and LCD Connector
17 [SPI_MISO]	PC6	SPIC MISO	EXT2, EXT3, LCD Connector, and Alternate signal header
18 [SPI_SCK]	PC7	SPIC SCK	EXT2, EXT3, LCD Connector, and Alternate signal header

Pin on EXT1	XMEGA pin	Function	Shared functionality
19 [GND]	-	-	GND
20 [VCC]	-	-	VCC

Table 4-2. Extension Header EXT2

Pin on EXT2	XMEGA pin	Function	Shared functionality
1 [ID]	-	-	Communication line to ID chip on extension board
2 [GND]	-	-	GND
3 [ADC(+)]	PA1	ADCA1 (GAINPOS)	
4 [ADC(-)]	PA6	ADCA6 (GAINNEG)	Alternate signal header
5 [GPIO1]	PB4	GPIO	
6 [GPIO2]	PB5	GPIO	
7 [PWM(+)]	PE5	TCE1 OC1B	
8 [PWM(-)]	PE4	TCE1 OC1A	
9 [IRQ/GPIO]	PB6	GPIO	Alternate signal header
10 [SPI_SS_B/GPIO]	PB7	GPIO	Alternate signal header
11 [TWI_SDA]	PF0	TWIF SDA	EXT3
12 [TWI_SCL]	PF1	TWIF SCL	EXT3
13 [USART_RX]	PF2	USARTF0 RXD0	
14 [USART_TX]	PF3	USARTF0 TXD0	
15 [SPI_SS_A]	PF4	GPIO	
16 [SPI_MOSI]	PC5	SPIC MOSI	EXT1, EXT3, and LCD Connector
17 [SPI_MISO]	PC6	SPIC MISO	EXT1, EXT3, LCD Connector, and Alternate signal header
18 [SPI_SCK]	PC7	SPIC SCK	EXT1, EXT3, LCD Connector, and Alternate signal header
19 [GND]	-	-	GND
20 [VCC]	-	-	VCC

Table 4-3. Extension Header EXT3

Pin on EXT3	XMEGA pin	Function	Shared functionality
1 [ID]	-	-	Communication line to ID chip on extension board
2 [GND]	-	-	GND

Pin on EXT3	XMEGA pin	Function	Shared functionality
3 [ADC(+)]	PA3	ADCA3 (GAINPOS)	
4 [ADC(-)]	PA7	ADCA7 (GAINNEG)	Alternate signal header
5 [GPIO1]	PK0	GPIO	
6 [GPIO2]	PK1	GPIO	
7 [PWM(+)]	PD5	TCD1 OC1B	
8 [PWM(-)]	PD4	TCD1 OC1A	
9 [IRQ/GPIO]	PK2	GPIO	
10 [SPI_SS_B/GPIO]	PK3	GPIO	
11 [TWI_SDA]	PF0	TWIF SDA	EXT2
12 [TWI_SCL]	PF1	TWIF SCL	EXT2
13 [USART_RX]	PF6	USARTF1 RXD1	
14 [USART_TX]	PF7	USARTF1 TXD1	
15 [SPI_SS_A]	PD0	GPIO	
16 [SPI_MOSI]	PC5	SPIC MOSI	EXT1, EXT2, and LCD Connector
17 [SPI_MISO]	PC6	SPIC MISO	EXT1, EXT2, LCD Connector, and Alternate signal header
18 [SPI_SCK]	PC7	SPIC SCK	EXT1, EXT2, LCD Connector, and Alternate signal header
19 [GND]	-	-	GND
20 [VCC]	-	-	VCC

4.1.2. LCD Extension Connector

Extension connector EXT4 is a special connector for LCD displays. The physical connector is a TE Connectivity 5-1734839-0 FPC connector.

Table 4-4. LCD Display Connector EXT4

Pin on EXT4	XMEGA pin	Function	Shared functionality
1 [ID]	-	-	Communication line to ID chip on extension board
2 [GND]	-	-	GND
3 [D0]	PJ0	D0	SRAM
4 [D1]	PJ1	D1	SRAM
5 [D2]	PJ2	D2	SRAM
6 [D3]	PJ3	D3	SRAM
7 [GND]	-	-	GND

Pin on EXT4	XMEGA pin	Function	Shared functionality
8 [D4]	PJ4	D4	SRAM
9 [D5]	PJ5	D5	SRAM
10 [D6]	PJ6	D6	SRAM
11 [D7]	PJ7	D7	SRAM
12 [GND]	-	-	GND
13 [D8]	-	-	
14 [D9]	-	-	
15 [D10]	-	-	
16 [D11]	-	-	
17 [GND]	-	-	GND
18 [D12]	-	-	
19 [D13]	-	-	
20 [D14]	-	-	
21 [D15]	-	-	
22 [GND]	-	-	GND
23 [D16]	-	-	
24 [D17]	-	-	
25 [D18]	-	-	
26 [D19]	-	-	
27 [GND]	-	-	GND
28 [D20]	-	-	
29 [D21]	-	-	
30 [D22]	-	-	
31 [D23]	-	-	
32 [GND]	-	-	GND
33 [PCLK / CMD_DATA_SEL]	PJ0 ALE1(1)	A0	SRAM
34 [VSYNC / CS]	PH7	EBI CS3	
35 [HSYNC / WE]	PH0	EBI NWE	SRAM
36 [DATA ENABLE / RE]	PH1	EBI NRD	SRAM
37 [SPI SCK]	PC7	SPIC SCK	EXT1, EXT2, EXT3, and Alternate signal header
38 [SPI MOSI]	PC5	SPIC MOSI	EXT1, EXT2, and EXT3

Pin on EXT4	XMEGA pin	Function	Shared functionality
39 [SPI MISO]	PC6	SPIC MISO	EXT1, EXT2, EXT3, and Alternate signal header
40 [SPI SS]	PB1	GPIO	
41 [DISP ENABLE]	PK5	GPIO	EDBG DGI
42 [TWI SDA]	PC0	TWIC SDA	EXT1 and EDBG
43 [TWI SCL]	PC1	TWIC SCL	EXT1 and EDBG
44 [IRQ1]	PK4	GPIO	EDBG DGI
45 [IRQ2]	PK6	GPIO	EDBG DGI
46 [PWM]	PF5	TCF1 OC1B	
47 [RESET]	PA5	GPIO	
48 [VCC]	-	VCC_P3V3	
49 [VCC]	-	VCC_P3V3	
50 [GND]	-	GND	

Note:

1. Connected through ALE1 latch.

4.1.3. Other Headers

In addition to the Xplained Pro Standard Extension Header, XMEGA A1U Xplained Pro has one additional header with spare signals that offers access to the I/O of the microcontroller which are otherwise not easily available elsewhere or might be favorable to have collected together. The header has a pitch of 2.54mm.

Table 4-5. Alternate Signals Header

Pin on header	XMEGA pin	Function	Shared functionality
1	PA0	AREFA	EXT1
2	PB0	AREFB	
3	PB2	DACB0	
4	PB3	DACB1	
5	PA7	ACA0OUT	EXT3
6	PA6	ACA1OUT	EXT2
7	PB7	ACB0OUT	EXT2
8	PB6	ACB1OUT	EXT2
9	PC6	CLOCKOUT (src)	EXT1, EXT2, EXT3, and LCD Connector
10	PC7	CLOCKOUT (per)	EXT1, EXT2, EXT3, and LCD Connector

Pin on header	XMEGA pin	Function	Shared functionality
11	PE7	EVOUT	EXT1
12	-	-	GND

4.1.4. Current Measurement Header

An angled 1x2, 100mil pin-header marked with MCU current measurement is located at the upper edge of the XMEGA A1U Xplained Pro. All power to the ATxmega128A1U 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 ATxmega128A1U to be powered through its I/O pins. This may cause permanent damage to the device.

4.2. Peripherals

4.2.1. Crystal

The XMEGA A1U Xplained Pro kit contains one crystal that can be used as clock source for the XMEGA device. The crystal has a cut-strap next to it that can be used to measure the oscillator safety factor. This is done by cutting the strap and adding a resistor across the strap. More information about oscillator allowance and safety factor can be found in appnote AVR4100.

Table 4-6. External 32.768kHz Crystals

Pin on XMEGA	Function
PQ0	XIN32 (TOSC1)
PQ1	XOUT32 (TOSC2)

4.2.2. Mechanical Buttons

XMEGA A1U Xplained Pro contains two mechanical buttons. One button is the RESET button connected to the XMEGA 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.

Table 4-7. Mechanical Buttons

Pin on XMEGA	Silkscreen text
RESET/PDI_CLK	RESET
PQ2	SW0

4.2.3. LED

There is one yellow LED available on the XMEGA A1U 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 4-8. LED Connections

Pin on XMEGA	LED
PQ3	Yellow LED0

4.2.4. USB

The XMEGA A1U Xplained Pro has a micro USB receptacle for use with the XMEGA A1U USB device module. To be able to detect when a USB cable is connected, a GPIO is used to detect the VBUS voltage on the connector.

Table 4-9. USB Connections

Pin on XMEGA	USB
PA2	VBUS Detection
PD6	USB D-
PD7	USB D+

4.2.5. SRAM

The XMEGA A1U Xplained Pro features a SRAM with latches for configuring the XMEGA in 2-PORT EBI mode. In this mode the address byte 0 and 1 is shared with data byte 0.

Table 4-10. SRAM Connections

Pin on XMEGA	SRAM
PJ0	D0 (data)
PJ1	D1 (data)
PJ2	D2 (data)
PJ3	D3 (data)
PJ4	D4 (data)
PJ5	D5 (data)
PJ6	D6 (data)
PJ7	D7 (data)
PJ0 through ALE1 latch	A0 (address)
PJ1 through ALE1 latch	A1 (address)
PJ2 through ALE1 latch	A2 (address)
PJ3 through ALE1 latch	A3 (address)
PJ4 through ALE1 latch	A4 (address)
PJ5 through ALE1 latch	A5 (address)
PJ6 through ALE1 latch	A6 (address)
PJ7 through ALE1 latch	A7 (address)
PJ0 through ALE2 latch	A8 (address)
PJ1 through ALE2 latch	A9 (address)
PJ2 through ALE2 latch	A10 (address)
PJ3 through ALE2 latch	A11 (address)
PJ4 through ALE2 latch	A12 (address)

Pin on XMEGA	SRAM
PJ5 through ALE2 latch	A13 (address)
PJ6 through ALE2 latch	A14 (address)
PJ7 through ALE2 latch	A15 (address)
PH4	A16 (address)
PH5	A17 (address)
PK7	A18 (address)
PH2	ALE1 (Address Latch Enable 1)
PH3	ALE2 (Address Latch Enable 2)
PH6	CS
PH0	WE
PH1	RE

4.3. Embedded Debugger Implementation

XMEGA A1U Xplained Pro contains an Embedded Debugger (EDBG) that can be used to program and debug the ATxmega128A1U using the Program Debug Interface (PDI). The Embedded Debugger also include a Virtual Com port interface over UART, an Atmel Data Gateway Interface over SPI and TWI and it monitors four of the XMEGA GPIOs. Atmel Studio can be used as a front end for the Embedded Debugger.

4.3.1. Program Debug Interface

The Program Debug Interface (PDI) 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 4-11. PDI Connections

Pin on XMEGA	Function
RESET/PDI_CLK	PDI clock
PDI_DATA	PDI data

4.3.2. Virtual COM Port

The Embedded Debugger acts as a Virtual Com Port gateway by using one of the ATxmega128A1U UARTs. For further information on how to use the Virtual COM port see Embedded Debugger.

Table 4-12. Virtual COM Port Connections

Pin on XMEGA	Function
PE2	USARTE0 RXD0 (XMEGA RX line)
PE3	USARTE0 TXD0 (XMEGA TX line)

4.3.3. Atmel Data Gateway Interface

The Embedded Debugger features an Atmel Data Gateway Interface (DGI) by using either a SPI or I^2C port. The DGI can be used to send a variety of data from the XMEGA to the host PC. For further information on how to use the DGI interface see Embedded Debugger.

Table 4-13. DGI Interface Connections when using USART

Pin on XMEGA	Function
PD1	USARTD0 XCK0
PD2	USARTD0 RXD0
PD3	USARTD0 TXD0

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

Pin on XMEGA	Function
PC0	TWIC SDA (Data line)
PC1	TWIC SCL (Clock line)

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 XMEGA application code. For further information on how to configure and use the GPIO monitoring features see Embedded Debugger.

Table 4-15. GPIO Lines Connected to the EDBG

Pin on XMEGA	Function
PK4	GPIO0
PK5	GPIO1
PK6	GPIO2
PK7	GPIO3

5. Appendix

5.1. Getting Started with IAR

IAR Embedded Workbench® for AVR® is a proprietary high efficiency compiler not based on GCC. Programming and debugging of Xplained Pro kits are supported in IAR™ Embedded Workbench for AVR using the Atmel-ICE 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 **Atmel-ICE** as the driver.
4. In the category **Debugger** > **Atmel-ICE**, select the **Atmel-ICE 1** tab. Select **PDI** as the interface and optionally select the **PDI** frequency.

Figure 5-1. Select Target Device

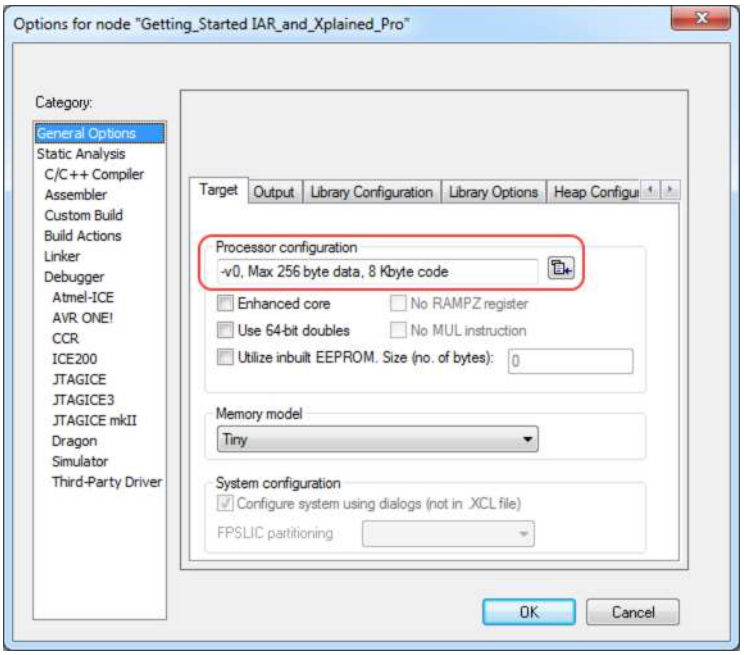


Figure 5-2. Select Debugger

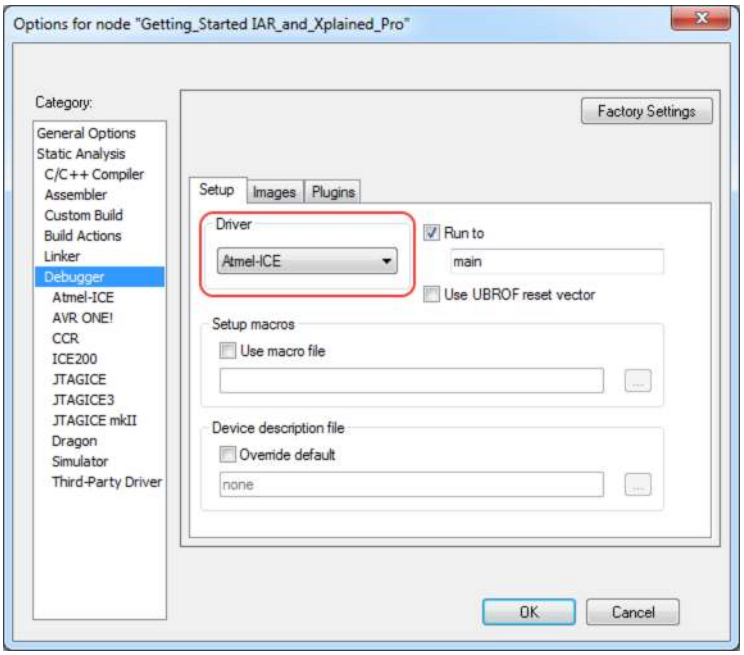
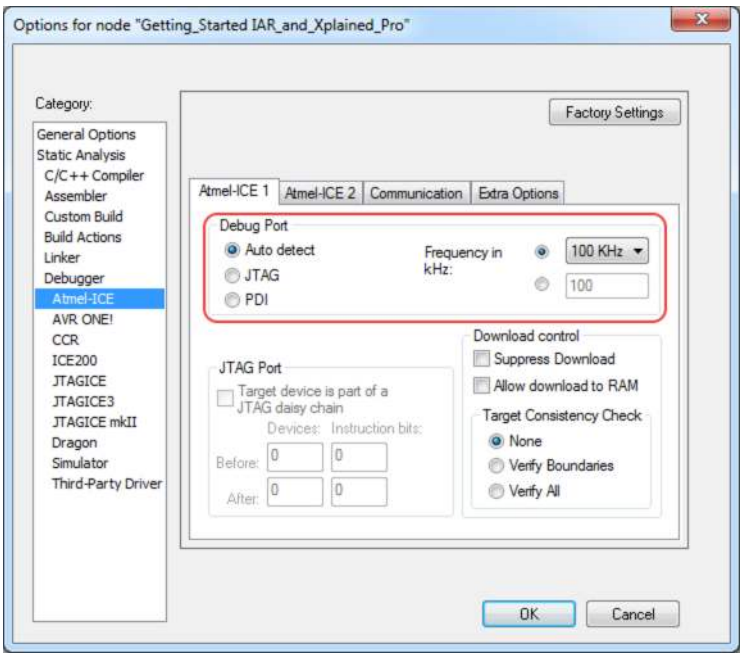


Figure 5-3. Configure Interface



6. Hardware Revision 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 XMEGA A1U Xplained Pro is A09-1802.

6.2. Revision 2

Revision 2 of XMEGA A1U Xplained Pro is the initial released version, there are no known issues.

7. Document Revision History

Doc. rev.	Date	Comment
42211B	04/2016	Added Getting Started with IAR.
42211A	01/2014	Initial document release.

8. 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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