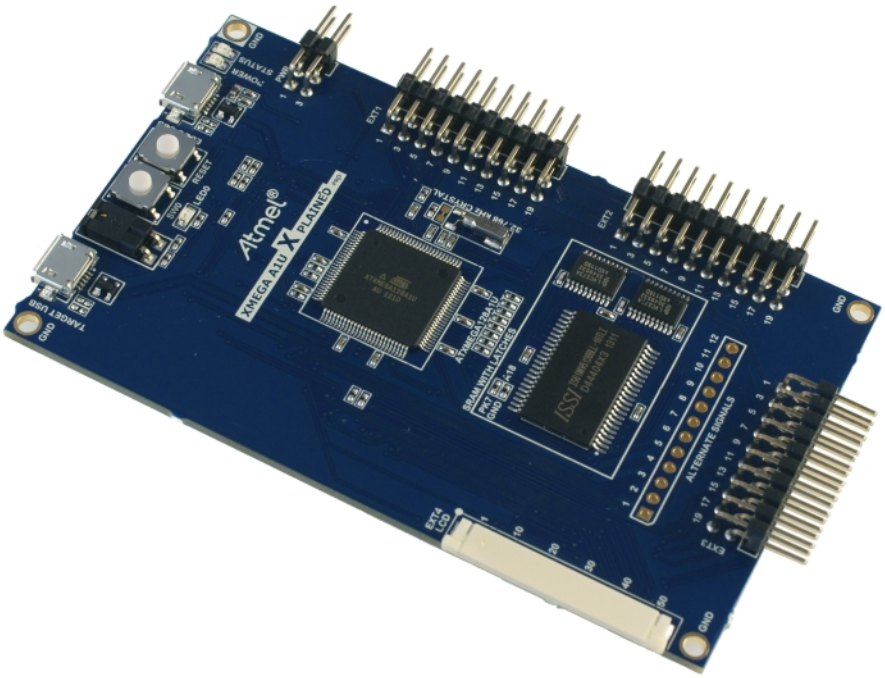
USER GUIDE

Atmel XMEGA A1U Xplained Pro



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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  - Atmel Data Gateway Interface (DGI) to target via USART and TWI
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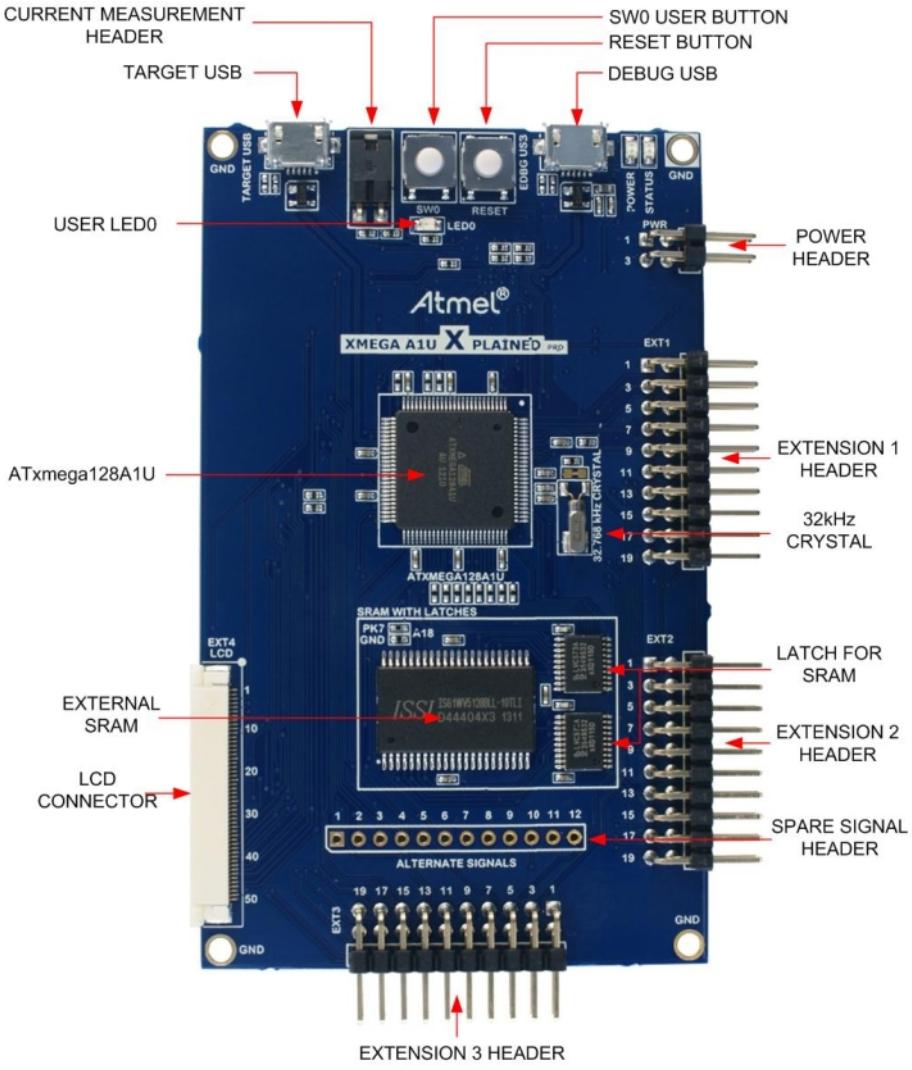
1.2 Kit overview

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 Quick-start

3 Steps to start exploring the Atmel Xplained Pro Platform

- Download and install **Atmel Studio**[1]
- Launch Atmel Studio
- Connect a USB micro B cable to the DEBUG USB port

2.2 Connecting the kit

When connecting Atmel XMEGA A1U Xplained Pro to your computer for the first time, the operating system will do a driver software installation. The driver file supports both 32-bit and 64-bit versions of Microsoft® Windows® XP and Windows 7.

Once connected the green power LED will be lit and Atmel Studio will autodetect which Xplained Pro evaluation- and extension kit(s) that's connected. You'll be presented with relevant information like datasheets and kit documentation. You also have the option to launch Atmel Software Framework (ASF) example applications. The target device is programmed and debugged by the on-board Embedded Debugger and no external programmer or debugger tool is needed. Please refer to the Atmel Studio user guide[2] for information regarding how to compile and program the kit.

2.3 Design documentation and related links

The following list contains links to the most relevant documents and software for XMEGA A1U Xplained Pro.

1. **Xplained Pro products** [3] - Atmel Xplained Pro is a series of small-sized and easy-to-use evaluation kits for 8- and 32-bit Atmel microcontrollers. It consists of a series of low cost MCU boards for evaluation and demonstration of features and capabilities of different MCU families.
2. **XMEGA A1U Xplained Pro User Guide** [4] - PDF version of this User Guide.
3. **XMEGA A1U Xplained Pro Design Documentation** [5] - Package containing schematics, BOM, assembly drawings, 3D plots, layer plots etc.
4. **EDBG User Guide** [6] - User guide containing more information about the onboard Embedded Debugger.
5. **Atmel Studio** [7] - Free Atmel IDE for development of C/C++ and assembler code for Atmel microcontrollers.
6. **IAR Embedded Workbench® for Atmel AVR®**. [8] 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 4k code size limited kick-start version available from their website.
7. **Atmel sample store** [9] - Atmel sample store where you can order samples of devices.

[1] http://www.atmel.com/atmelstudio
[2] http://www.atmel.com/atmelstudio
[3] http://www.atmel.com/XplainedPro
[4] http://www.atmel.com/Images/Atmel-42211-XMEGA-A1U-Xplained-Pro_User-Guide.pdf
[5] http://www.atmel.com/Images/Atmel-42211-XMEGA-A1U-Xplained-Pro_User-Guide.zip
[6] http://www.atmel.com/Images/Atmel-42096-Microcontrollers-Embedded-Debugger_User-Guide.pdf
[7] http://www.atmel.com/atmelstudio
[8] http://www.iar.com/en/Products/IAR-Embedded-Workbench/AVR/
[9] http://www.atmel.com/system/samplesstore

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 that 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 that are connected through a set of standardized headers and connectors. Each extension board has an identification (ID) chip to uniquely identify which boards are mounted on a Xplained Pro MCU board. This information is used to present relevant user guides, application notes, datasheets and example code through Atmel Studio. Available Xplained Pro MCU and extension boards can be purchased in the Atmel Web Store[1].

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 3 interfaces; a debugger, Virtual COM Port and Data Gateway Interface (DGI).

In conjunction with Atmel Studio, the EDBG debugger interface can program and debug the ATxmega128A1U. On the XMEGA A1U Xplained Pro, the PDI interface is connected between the EDBG and the ATxmega128A1U.

The Virtual COM Port is connected to a UART port on the ATxmega128A1U (see section “Embedded Debugger implementation” on page 16 for pinout), and provides an easy way to communicate with the target application through simple terminal software. It offers variable baud rate, parity and stop bit settings. Note that the settings on the target device UART must match the settings given in the terminal software.

The DGI consists of several physical data interfaces for communication with the host computer. Please, see section “Embedded Debugger implementation” on page 16 for available interfaces and pinout. Communication over the interfaces are 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. The DGI uses a proprietary protocol, and is thus only compatible with Atmel Studio.

The EDBG controls two LEDs on XMEGA A1U Xplained Pro, a power LED and a status LED. Table 3-1, “EDBG LED control” on page 6 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 every time something happens on 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[2].

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 board 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. Table 3-2, “Xplained Pro ID Chip Content” on page 6 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’

[1] http://store.atmel.com/CBC.aspx?q=c:100113
[2] http://www.atmel.com/Images/Atmel-42096-Microcontrollers-Embedded-Debugger_User-Guide.pdf

Data Field	Data Type	Example Content
Minimum Voltage [mV]	uint16_t	3000
Maximum Voltage [mV]	uint16_t	3600
Maximum Current [mA]	uint16_t	30

3.3 Power supply

The XMEGA A1U Xplained Pro kit can be powered either by USB or by an external power source through the 4-pin power header, marked PWR. This connector is described in "Xplained Pro power header" on page 10. The available power sources and specifications are listed in Table 3-3, "Power sources for XMEGA A1U Xplained Pro" on page 7.

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. 4.3 V to 5.5 V 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)	500 mA (according to USB spec)	DEBUG USB
Target USB	4.4V to 5.25V (according to USB spec)	500 mA (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

Note External power is required when the 500mA through the USB connector is not enough to power a connected USB device in a USB host application.

3.3.1 Measuring XMEGA power consumption

As part of an evaluation of the XMEGA it can be of interest to measure its power consumption. Because the device has a separate power plane (VCC_MCU_P3V3) on this board it is possible to measure the current consumption by measuring the current that is flowing into this plane. The VCC_MCU_P3V3 plane is connected via a jumper to the main power plane (VCC_TARGET_P3V3) and by replacing the jumper with an ampere meter it is possible to determine the current consumption. To locate the current measurement header, please refer to Figure 1-1, "XMEGA A1U Xplained Pro evaluation kit overview" on page 4.

Warning Do not power the board without having the jumper or an ampere meter mounted. This can cause the XMEGA to be powered through its I/O pins and cause undefined operation of the device.

3.4 Standard 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 headers. Xplained Pro MCU boards have male headers while Xplained Pro extensions have their female counterparts. Note that all pins are not always connected. However, all the connected pins follow the defined pin-out described in Table 3-4,

"Xplained Pro extension header" on page 8. The extension headers can be used to connect a wide variety of Xplained Pro extensions to Xplained Pro MCU boards and to access the pins of the target MCU on Xplained Pro MCU board directly.

Table 3-4. Xplained Pro extension header

Pin number	Name	Description
1	ID	Communication line to the ID chip on 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 positive 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	TWI_SDA	Data line for two-wire interface. Always implemented, bus type.
12	TWI_SCL	Clock line for two-wire interface. Always implemented, bus type.
13	USART_RX	Receiver line of Universal Synchronous and Asynchronous serial Receiver and Transmitter.
14	USART_TX	Transmitter line of Universal Synchronous and Asynchronous serial Receiver and Transmitter.
15	SPI_SS_A	Slave select for SPI. Should be unique if possible.
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 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 touchcontroller. The connector pin-out definition is shown in Table 3-5, "Xplained Pro LCD connector" on page 8. Note that usually only one display interface is implemented, either 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 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 ID chip on extension board.	
2	GND	Ground	
3	D0	Data line	

Pin number	Name	RGB interface description	MCU interface description
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	
18	D12	Data line	
19	D12	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	and data select. One address line of the MCU select either the Command register or the 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 line of Serial peripheral interface	
39	SPI MISO	Master in slave out line of Serial peripheral interface	
40	SPI SS	Slave select for SPI. Should be unique if possible	
41	ENABLE	Display enable signal	
42	TWI SDA	I2C data line (maxTouch®)	

Pin number	Name	RGB interface description	MCU interface description
43	TWI SCL	I2C clock line (maxTouch)	
44	IRQ1	maxTouch interrupt line	
45	IRQ2	Interrupt line for other I2C devices	
46	PWM	Backlight control	
47	RESET	Reset for both display and maxTouch	
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 the 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 for the 3.3V regulated output. To locate the current measurement header, please refer to Figure 1-1, “XMEGA A1U Xplained Pro evaluation kit overview” on page 4

Table 3-6. Power header PWR

Pin number PWR header	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 for the kit)

Note If the board is powered from a battery source it is recommended to use the PWR header. If there is a power source connected to EDBG USB, the EDBG is activated and it will consume more power.

4. Hardware user 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 I/O 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 on page 7. All headers have a pitch of 2.54 mm.

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
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	

Pin on EXT2	XMEGA pin	Function	Shared functionality
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
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

4.2 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
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	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
39 [SPI MISO]	PC6	SPIC MISO	EXT1, EXT2, EXT3, and Alternate signal header
40 [SPI SS]	PB1	GPIO	

Pin on EXT4	XMEGA pin	Function	Shared functionality
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	

4.3 Other headers

In addition to the "I/O extension headers" on page 11, 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 favourable to have collected toghether. 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
11	PE7	EVOUT	EXT1
12	-	-	GND

4.4 Peripherals

4.4.1 Crystal

The XMEGA A1U Xplained Pro kit contains one crystals 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[1].

Table 4-6. External 32.768kHz crystals

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

[1] http://www.atmel.com/images/doc8333.pdf

4.4.2 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

4.4.3 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

4.4.4 USB

The XMEGA A1U Xplained Pro has a micro USB receptable 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+

4.4.5 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 ALE1	A0 (address)
PJ1 ALE1	A1 (address)
PJ2 ALE1	A2 (address)
PJ3 ALE1	A3 (address)
PJ4 ALE1	A4 (address)
PJ5 ALE1	A5 (address)
PJ6 ALE1	A6 (address)
PJ7 ALE1	A7 (address)

Pin on XMEGA	SRAM
PJ0 ALE2	A8 (address)
PJ1 ALE2	A9 (address)
PJ2 ALE2	A10 (address)
PJ3 ALE2	A11 (address)
PJ4 ALE2	A12 (address)
PJ5 ALE2	A13 (address)
PJ6 ALE2	A14 (address)
PJ7 ALE2	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

4.5 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.

4.5.1 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” on page 6.

Table 4-11. PDI connections

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

4.5.2 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” on page 6.

Table 4-12. Virtual COM port connections

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

4.5.3 Atmel Data Gateway Interface

The Embedded Debugger features an Atmel Data Gateway Interface (DGI) by using either a SPI or I²C 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” on page 6.

Table 4-13. DGI interface connections when using USART

Pin on XMEGA	Function
PD1	USARTD0 XCK0
PD2	USARTD0 RXD0

Pin on XMEGA	Function
PD3	USARTD0 TXD0

Table 4-14. DGI interface connections when using I²C

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” on page 6.

Table 4-15. GPIO lines connected to the EDBG

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

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, through Atmel Studio or by looking at the sticker on the bottom side of the PCB.

By connecting a 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 Kits 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 kit identifier for XMEGA A1U Xplained Pro is 1802.

5.2 Revision 2

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

6. Document revision history

Document revision	Date	Comment
42211A	01/2014	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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