Atmel

Preface

The Atmel® ATmega324PB Xplained Pro evaluation kit is a hardware platform to evaluate the ATmega324PB microcontroller.

Supported by the Atmel Studio integrated development platform, the kit provides easy access to the features of the Atmel ATmega324PB 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 ATmega324PB.

The Xplained Pro extension series evaluation kits offers additional peripherals to extend the features of the board and ease the development of custom designs.
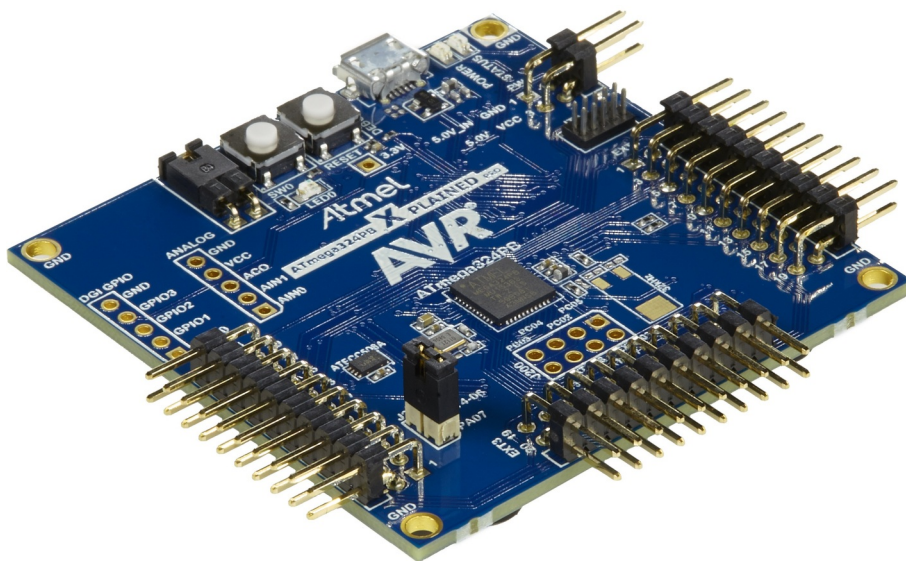
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- Two possible power sources
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1.2. Kit Overview

The Atmel ATmega324PB Xplained Pro evaluation kit is a hardware platform to evaluate the Atmel ATmega324PB.

The kit offers a set of features that enables the ATmega324PB user to get started using the ATmega324PB peripherals right away and to get an understanding of how to integrate the device in their own design.

Figure 1-1. ATmega324PB Xplained Pro Evaluation Kit Overview
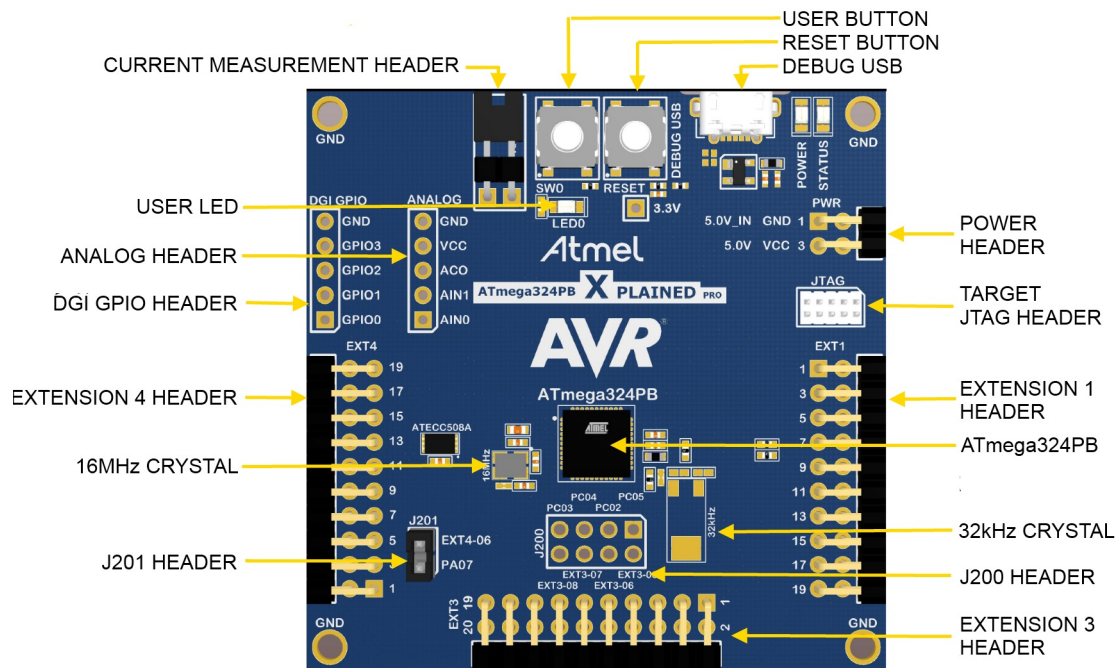
2. Getting Started

2.1. Xplained Pro Quick Start

Three 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, and Windows 8.

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 ATmega324PB 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 ATmega324PB 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 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.
- **ATmega324PB Xplained Pro on the Atmel web** - 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 ATmega324PB 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 ATmega324PB. On ATmega324PB Xplained Pro, the JTAG interface is connected between the EDBG and the ATmega324PB.

The Virtual COM Port is connected to a UART on the ATmega324PB 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 ATmega324PB must match the settings given in the terminal software.

> **Info:** If not set automatically, data terminal ready (DTR) must be set in the terminal software.

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 ATmega324PB 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 ATmega324PB 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 ATmega324PB Xplained Pro kit can be powered by several power sources as listed in the table below.

Table 3-3. Power Sources for ATmega324PB 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

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.

> **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^{2}C_SDA	Data line for I^{2}C interface. Always implemented, bus type.
12	I^{2}C_SCL	Clock line for I^{2}C 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.

Pin number	Name	Description
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 ATmega324PB 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)

4. Hardware User Guide

4.1. Connectors

The following sections describes the implementation of the relevant connectors and headers on ATmega324PB Xplained Pro and their connection to the ATmega324PB. The tables of connections in the sections also describes which signals are shared between the headers and on-board functionality. The figure below shows all available connectors and jumpers on ATmega324PB Xplained Pro.

Figure 4-1. ATmega324PB Xplained Pro Connector Overview
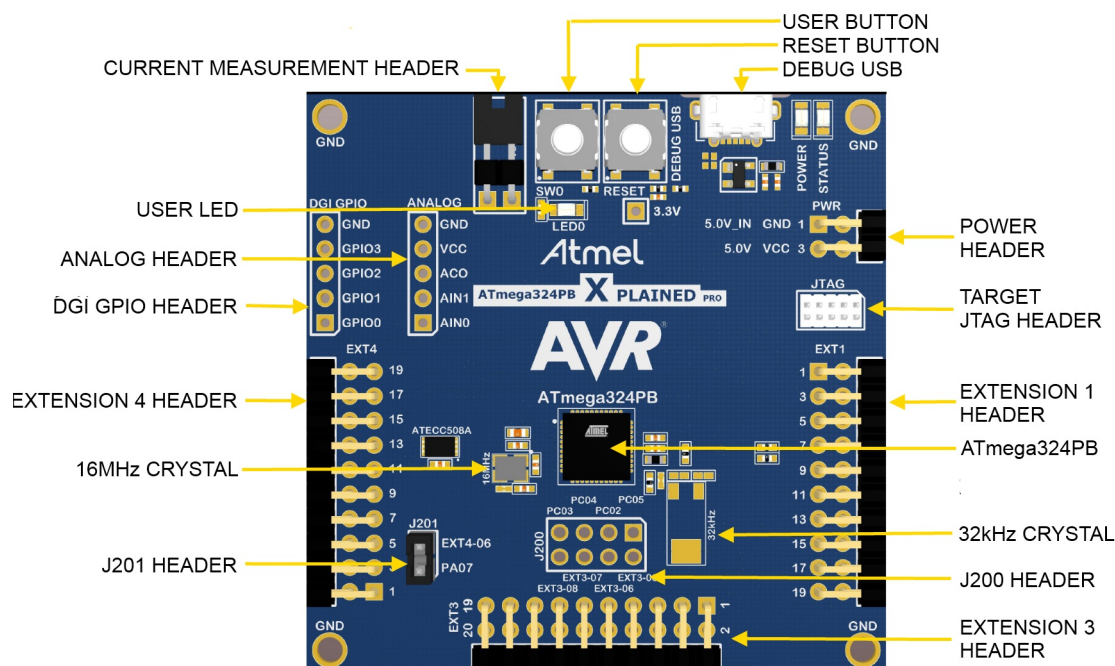
4.1.1. Xplained Pro Extension Headers

The ATmega324PB Xplained Pro headers EXT1, EXT3, and EXT4 offers access to the I/O of the microcontroller in order to expand the board e.g., by connecting extensions to the board. These headers are based on the standard extension header specified in Table 3-4 Xplained Pro Standard Extension Header on page 8. The headers have a pitch of 2.54mm.

Table 4-1. Extension Header EXT1

EXT1 pin	ATmega324PB pin	Function	Shared functionality
1 [ID]	-	-	Communication line to the ID chip on an extension board
2 [GND]	-	-	Ground
3 [ADC(+)]	PA0	ADC0/Y0	
4 [ADC(-)]	PA1	ADC1/Y1	
5 [GPIO1]	PA2	ADC2/Y2	
6 [GPIO2]	PA3	ADC3/Y3	

EXT1 pin	ATmega324PB pin	Function	Shared functionality
7 [PWM(+)]	PD5	TC1-OCA/X5	
8 [PWM(-)]	PD4	TC1-OCB/X4	
9 [IRQ/GPIO]	PC1	TW0-SDA/X11	EDBG GPIO2
10 [SPI_SS_B/GPIO]	PC0	TW0-SCL/X10	
11 [TWI_SDA]	PE5	TW1-SDA	EXT1/3/4/EDBG I^{2}C
12 [TWI_SCL]	PE6	TW1-SCL	EXT1/3/4/EDBG I^{2}C
13 [USART_RX]	PD0	U0-RXD	
14 [USART_TX]	PD1	U0-TXD	
15 [SPI_SS_A]	PB4	S0-SS	EDBG GPIO0
16 [SPI_MOSI]	PB5	S0-MOSI	EXT1/3/4/EDBG SPI
17 [SPI_MISO]	PB6	S0-MISO	EXT1/3/4/EDBG SPI
18 [SPI_SCK]	PB7	S0-SCK	EXT1/3/4/EDBG SPI
19 [GND]	-	-	Ground
20 [VCC]	-	-	Power for extension board

Table 4-2. Extension Header EXT3

EXT3 pin	ATmega324PB pin	Function	Shared functionality
1 [ID]	-	-	Communication line to the ID chip on an extension board
2 [GND]	-	-	Ground
3 [ADC(+)]	PC5		Analog header and EDBG JTAG TDI via J200
4 [ADC(-)]	PC7		USER LED
5 [GPIO1]	PE4	GPIO/AREF	EXT4.8
6 [GPIO2]	PC2	GPIO	EDBG JTAG TCK via J200
7 [PWM(+)]	PC4	TC4-OCA	EDBG JTAG TDO via J200
8 [PWM(-)]	PC3	GPIO	EDBG JTAG TMS via J200
9 [IRQ/GPIO]	PC6	GPIO	USER BUTTON/EDBG GPIO3
10 [SPI_SS_B/GPIO]	PB1	GPIO	
11 [TWI_SDA]	PE5	TW1-SDA	EXT1/3/4/EDBG I^{2}C
12 [TWI_SCL]	PE6	TW1-SCL	EXT1/3/4/EDBG I^{2}C
13 [USART_RX]	PD2	U1-RXD	EDBG CDC
14 [USART_TX]	PD3	U1-TXD	EDBG CDC
15 [SPI_SS_A]	PD6	SPI-SS	

EXT3 pin	ATmega324PB pin	Function	Shared functionality
16 [SPI_MOSI]	PB5	S0-MOSI	EXT1/3/4/EDBG SPI
17 [SPI_MISO]	PB6	S0-MISO	EXT1/3/4/EDBG SPI
18 [SPI_SCK]	PB7	S0-SCK	EXT1/3/4/EDBG SPI
19 [GND]	-	-	Ground
20 [VCC]	-	-	Power for extension board

Table 4-3. Extension Header EXT4

EXT4 pin	ATmega324PB pin	Function	Shared functionality
1 [ID]	-	-	Communication line to the ID chip on an extension board
2 [GND]	-	-	Ground
3 [ADC(+)]	PA4	ADC4	
4 [ADC(-)]	PA5	ADC5	
5 [GPIO1]	PA6	ADC6	
6 [GPIO2]	PA7	ADC7	EDBG SPI SS via strap J201
7 [PWM(+)]	PB3	TC0-OCA/AIN1	ANALOG header
8 [PWM(-)]	PE4	AREF	EXT3.5
9 [IRQ/GPIO]	PB2	INT2/PC1-10 AIN0	EDBG GPIO1/ANALOG header
10 [SPI_SS_B/GPIO]	PD7	TC2-OCA	
11 [TWI_SDA]	PE5	TW1-SDA	EXT1/3/4/EDBG I^{2}C
12 [TWI_SCL]	PE6	TW1-SCL	EXT1/3/4/EDBG I^{2}C
13 [USART_RX]	PE2	U2-RXD	
14 [USART_TX]	PE3	U2-TXD	
15 [SPI_SS_A]	PB0	SPI SS	
16 [SPI_MOSI]	PB5	S0-MOSI	EXT1/3/4/EDBG SPI
17 [SPI_MISO]	PB6	S0-MISO	EXT1/3/4/EDBG SPI
18 [SPI_SCK]	PB7	S0-SCK	EXT1/3/4/EDBG SPI
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 ATmega324PB Xplained Pro. All power to the ATmega324PB 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 ATmega324PB to be powered through its I/O pins. This may cause permanent damage to the device.

4.1.3. Other Headers

In addition to the Xplained Pro extension headers, ATmega324PB Xplained Pro has additional headers with 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. All headers have a pitch of 2.54mm.

The J305 header enables easy connection to the ATmega324PB comparator function.

Table 4-4. Analog Comparator Header (J305)

Pin on header	ATmega324PB pin	Function	Shared functionality
1	PB2	AIN0	EXT4.9
2	PB3	AIN1	EXT4.7
3	PC5	ACO	EXT3 via J200 and EDBG JTAG TDI
4		VCC Target	
5		GND	

> **Tip:** Disable JTAG interface to get access to ACO. Set the JTD bit in MCUCR to disable the JTAG interface.

> **Warning:** Use of the JTAG signals might cause conflict when using the debugger/programmer.

The J200 header enables use of the ATmega324PB JTAG signals for EXT3.

Table 4-5. JTAG to EXT3 Strap Header (J200)

Pin on header	ATmega324PB pin	EXT3 pin	Shared functionality
1	PC5_JTAG_TDI		EDBG via R404
2		EXT3.3	
3	PC2_JTAG_TCK		EDBG via R401
4		EXT3.6	
5	PC4_JTAG_TDO		EDBG via R402
6		EXT3.7	
7	PC3_JTAG_TMS		EDBG via R403
8		EXT3.8	

Tip: Disable JTAG interface to get access to PC2 to PC5. Set the JTD bit in MCUCR to disable the JTAG interface.

Warning: Use of the JTAG signals might cause conflict when using the debugger/programmer.

Tip: Assemble strap in the J200 header and remove strap when using the JTAG interface.

The J201 strap enables use of the ATmega324PB PA7 for both the EXT4 and EDBG SPI-SS.

Table 4-6. PA7 to EXT4 strap (J201)

Pin on header	ATmega324PB pin	EXT4 pin	Shared functionality
1	PA7		EDBG SPI- SS
2		EXT4.6	

Remember: Remove the strap if the EDBG SPI bus is to be used.

The DGI GPIO signals are available on a separate header J303.

Table 4-7. DGI GPIO Header (J303)

Pin on header	ATmega324PB pin	EDBG pin	Extension pin
1	PB4	GPIO0	EXT1.15
2	PB2	GPIO1	EXT4.9
3	PC1	GPIO2	EXT1.9
4	PC6	GPIO3	EXT3.9
5	GND	GND	GND

Tip: The GPIO signals can be disconnected from the ATmega324PB by removing R215, R216, R217, and R218. The header can be used to monitor any signal on the board with the EDBG.

4.2. Peripherals

4.2.1. Crystals

The ATmega324PB Xplained Pro kit contains one mounted 16MHz crystal and a footprint for a 32.768kHz crystal that can be used as clock sources for the ATmega324PB. The crystals have cut-straps next to them that can be used to measure the oscillator safety factor. This is done by cutting the strap and adding a resistor across the strap. Information about oscillator allowance and safety factor can be found in application note AVR4100, information about clock calibration and compensation can be found in application note AT03155.

The footprint for the 32KHz crystal is based on the Micro Crystal Switzerland MS1V-T1K series.

Info: Note that PC6 and PC7 are shared signals. To disconnect PC6 and PC7 from all functionality except XTAL remove R211 and R212.

Table 4-8. External 32.768kHz Crystal Footprint

ATmega324PB pin	Function	Shared functionality
PC6	TOSC1	USER BUTTON/EXT3.9/EDBG GPIO3 via R211
PC7	TOSC2	USER LED/EXT3.4 via R212

Table 4-9. External 16MHz Crystal

ATmega324PB pin	Function	Shared functionality
PE0	XTAL2	-
PE1	XTAL1	-

4.2.2. LED

There is one yellow LED available on the ATmega324PB 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 4-10. LED Connection

ATmega324PB pin	Function	Shared functionality
PC7	Yellow LED0	EXT3.4

4.2.3. Mechanical Buttons

ATmega324PB Xplained Pro contains two mechanical buttons. One button is the RESET button connected to the ATmega324PB 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.

Notice: There is no pull-up resistor connected to the generic user button. Remember to enable the internal pull-up in the ATmega324PB to use the button.

Table 4-11. Mechanical Buttons

ATmega324PB pin	Silkscreen text	Shared functionality
RESET	RESET	-
PC6	SW0	EXT3.9/DGI GPIO3

4.2.4. CryptoAuthentication Device

The ATmega324PB Xplained Pro has a CryptoAuthentication™ Device (ATECC508A) connected to the I^2C buss.

More information about ATECC508A can be found at http://www.atmel.com/devices/ATECC508A.aspx.

Table 4-12. ATECC508A Connections

ATmega324PB pin	ATECC508A pin	Function	Shared functionality
PE5	5	SDA	EXT1/EXT3/EXT4/EDBG I^2C
PE6	6	SCL	EXT1/EXT3/EXT4/EDBG I^2C

4.3. Embedded Debugger Implementation

ATmega324PB Xplained Pro contains an Embedded Debugger (EDBG) that can be used to program and debug the ATmega324PB using JTAG. The Embedded Debugger also include a Virtual Com port interface over UART, an Atmel Data Gateway Interface over SPI, and TWI and it includes four of the ATmega324PB GPIOs. Atmel Studio can be used as a front end for the Embedded Debugger.

4.3.1. JTAG

The JTAG interface use four 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 4-13. JTAG Connections

ATmega324PB pin	Function	Shared functionality
PC2	JTAG-TCK	J200
PC3	JTAG-TMS	J200
PC4	JTAG-TDO	J200
PC5	JTAG-TDI	J200

4.3.2. Virtual COM Port

The Embedded Debugger acts as a Virtual Com Port gateway by using one of the ATmega324PB UARTs. For further information on how to use the Virtual COM port, see Embedded Debugger on page 6.

Table 4-14. Virtual COM Port Connections

ATmega324PB pin	Function	Shared functionality
PD2	U1-RXD (ATmega324PB USART1 Receive Pin)	EXT3
PD3	U1-TXD (ATmega324PB USART1 Transmit Pin)	EXT3

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 ATmega324PB to the host PC. For further information on how to use the DGI interface, see Atmel Data Visualizer and the EDBG User Guide.

Table 4-15. DGI Interface Connections When Using SPI

ATmega324PB pin	Function	Shared functionality
PA7	GPIO/SPI SS (Slave select) (ATmega324PB is Master)	EXT4.8 via J201
PB6	SPI MISO (Master In, Slave Out)	EXT1/EXT3/EXT4
PB5	SPI MOSI (Master Out, Slave in)	EXT1/EXT3/EXT4
PB7	SPI SCK (Clock Out)	EXT1/EXT3/EXT4

Table 4-16. DGI Interface Connections When Using I²C

ATmega324PB pin	Function	Shared functionality
PE5	SDA (Data line)	EXT1/EXT3/EXT4
PE6	SCL (Clock line)	EXT1/EXT3/EXT4

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 ATmega324PB 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 4-17. GPIO Lines Connected to the EDBG

ATmega324PB pin	Function	Shared functionality
PB4	GPIO0	EXT1.15/J303
PB2	GPIO1	EXT4.9/J303
PC1	GPIO2	EXT1.9/J303
PC6	GPIO3	EXT3.9/USER BUTTON/J303

4.4. Battery Powered Board

The ATmega324PB Xplained Pro can be powered from an external battery connected directly to the target. To do this the on-board programmer/debugger has to be disconnected.

The following procedure should be followed:

1. Remove all resistors connecting the EDBG to the target. They can be found on the backside nicely aligned and ready to be removed.
2. Remove R105 to disconnect the target from the on board power supply.
3. Attach an external battery to the Power header (J101). GND to J101.2 and V_{CC} to J101.4 (usually the RED wire).

Tip: An external debugger/programmer can be connected to the ATmega324PB JTAG header.

Tip: To save battery power during debugging it is possible to connect a wire from the 3.3V test point (J100) to the power header J101.4, using the USB power to supply the target.

Figure 4-2. ATmega324PB Xplained Pro Connector Overview
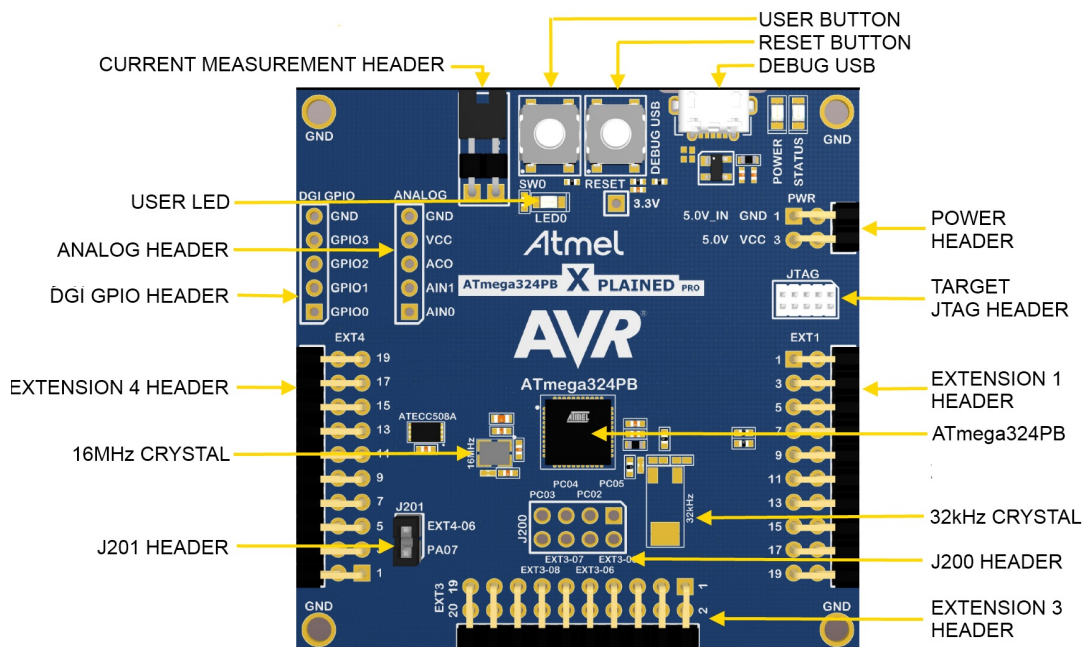
5. Appendix

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 **JTAG** as the interface and optionally select the **JTAG** frequency.

Figure 5-1. Select Target Device
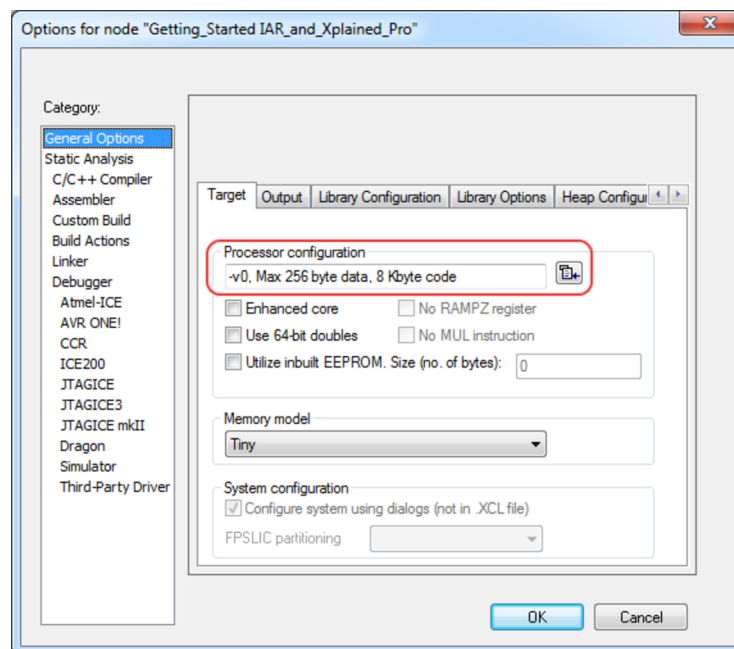
Figure 5-2. Select Debugger
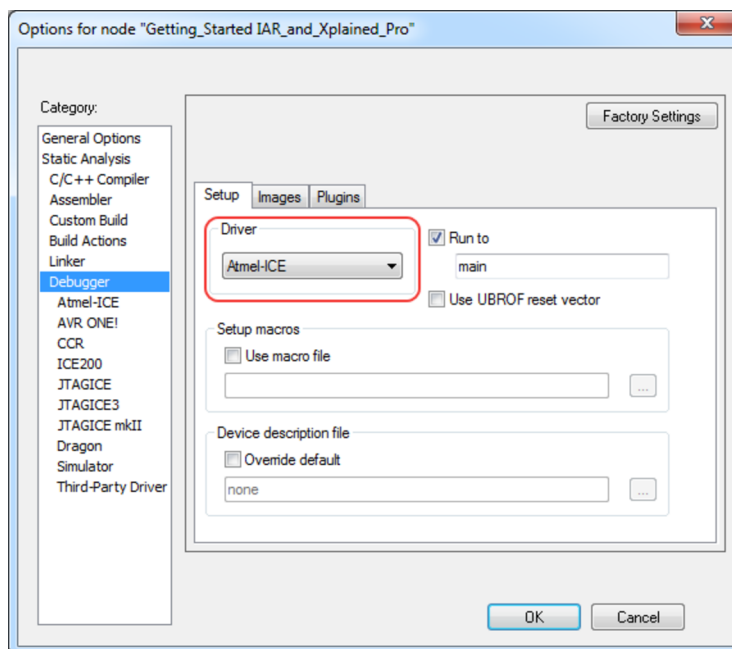
Figure 5-3. Configure Interface
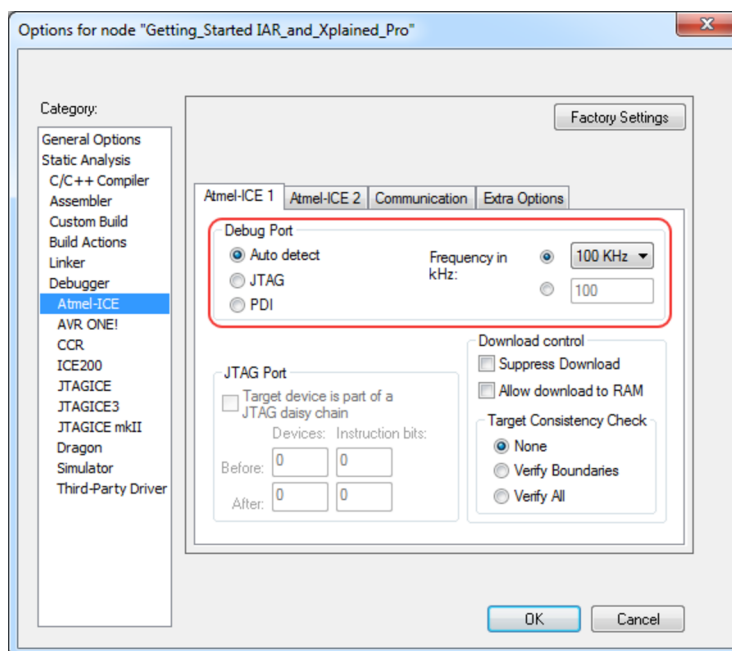
6. Hardware Revision History and Known Issues

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 ATmega324PB Xplained Pro is A09-2588.

6.2. Revision 3

Revision 3 fixes the silk screen issue in revision 2 and adds R215, R216, R217, and R218. There are no known issues with this revision.

6.3. Revision 2

Revision 2 has an error in the silkscreen for J200, correct signal allocation is as documented in Table 4-5 JTAG to EXT3 Strap Header (J200) on page 13.

DGI GPIO header can not be disconnected from target, this revision does not have R215, R216, R217, and R218.

The figure below shows the evaluation kit overview for revision 2 of the kit.

Figure 6-1. ATmega324PB Xplained Pro Evaluation Kit Overview Revision 2
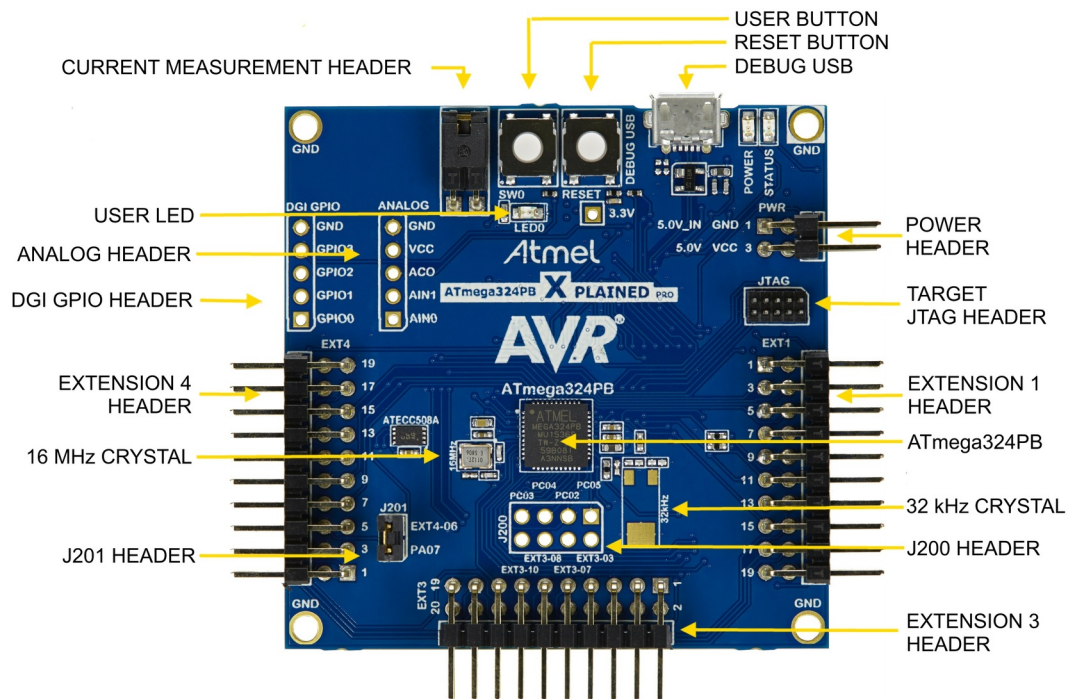
7. Document Revision History

Doc. rev.	Date	Comment
42633B	12/2015	Added revision 3 to the Hardware Revision History and Known Issues section.
42633A	11/2015	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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