
AVR1907: Xplain Hardware User's Guide

Features

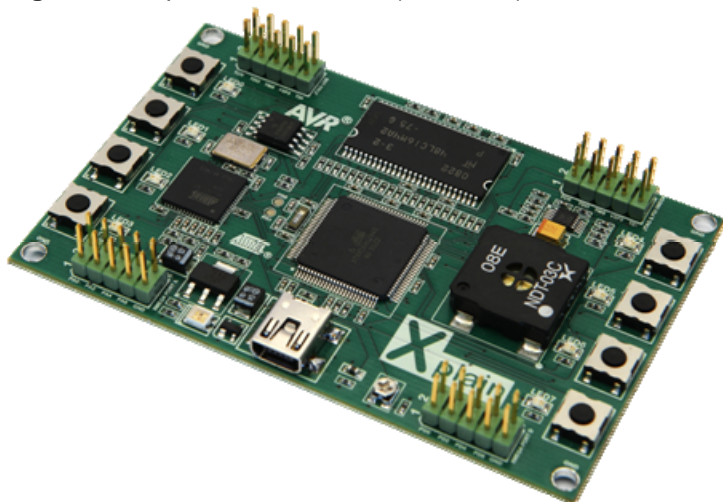
- ATxmega128A1 microcontroller
- External Memory
 - 8MB SDRAM
 - 8MB Serial Data Flash
- AT90USB1287
 - Communication gateway
- Analog Input (to ADC)
 - Temperature sensor
 - Potentiometer
- Analog Output (from DAC)
 - Mono speaker via audio amplifier
- Digital IO
 - UART communication through USB gateway
 - 8 micro switch buttons
 - 8 LEDs
 - 8 spare analog pins
 - 8 spare digital pins

1 Introduction

The Xplain evaluation kit is a hardware platform to evaluate the ATxmega128A1.

The kit offers a larger range of features that enables the XMEGA™ user to get started using the XMEGA's peripherals right away and to get an understanding of how to integrate the XMEGA in their own design.

Figure 1-1. Xplain evaluation kit (revision 1).



8-bit **AVR**[®]
Microcontrollers

Application Note

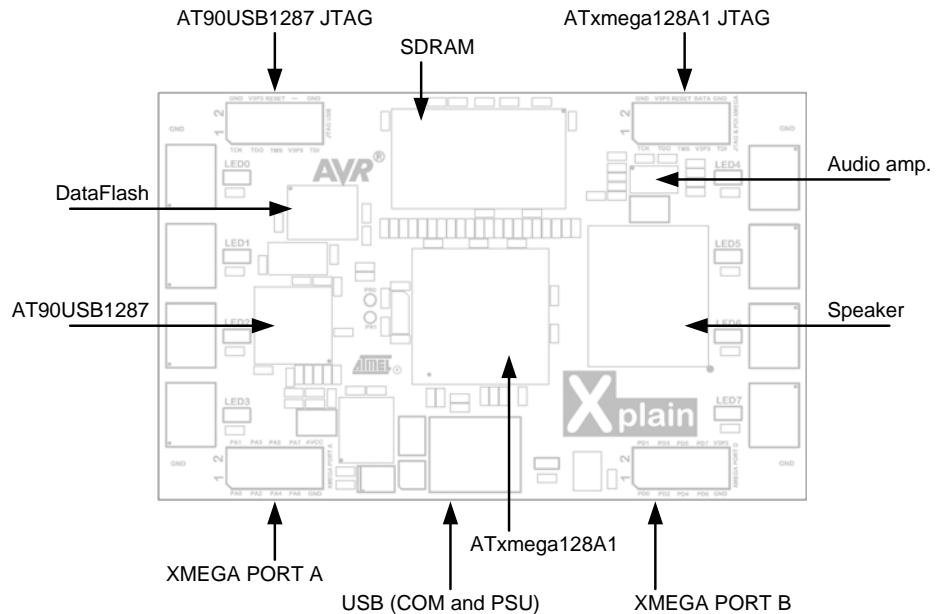
Rev. 8203A-AVR-02/09



2 General information

The Xplain kit is intended to demonstrate the ATxmega128A1, and the hardware that relates to the AT90USB1287 is therefore not covered in this document.

Figure 2-1. Overview of the Xplain kit.



2.1 Preprogrammed firmware

The Xplain kit comes with both the ATxmega128A1 and the AT90USB1287 preprogrammed.

The preprogrammed firmware in the XMEGA plays different sounds when the micro switch buttons are pushed.

The preprogrammed AT90USB1287 firmware offers a UART-to-USB gateway between the ATxmega128A1 UART and a PC host.

2.2 Power supply

The kit is powered from USB which leaves two options to power it: Either connect the kit to a PC through an USB cable, or to a 5V USB power supply (AC/DC adapter).

2.3 Communication through UART-to-USB gateway

The XMEGA's UARTC0 is connected to a software UART on the AT90USB1287. The AT90USB1287 UART is communicating at 9600 baud, using one start bit, eight data bits, one stop bit and no parity.

When the AT90USB1287 device is enumerated (connected to a PC) the data transmitted from the XMEGA is passed on to a (virtual) COM port. This means that it is possible to use a terminal program to receive the transmitted data on a PC.

Similarly data transmitted from the PC COM port is passed on to the XMEGA UART through the gateway.

If the USB device is not enumerated, e.g. powering the kit from an USB supply adapter, the AT90USB1287 device's UART will operate in loop back mode (echo back everything it receives).

3 Connectors

The Xplain kit has four 10-pin 100mill headers. Two are used for programming the ATxmega128A1 and AT90USB1287, and two are to access spare analog and digital pins on the XMEGA (expansion headers).

3.1 Programming headers

In addition to programming the XMEGA through the AT90USB1287, the XMEGA can be programmed and debugged by connecting an external programming/debugging tool to the "JTAG & PDI XMEGA" pin header (J100). The pin header is having a standard JTAG programmer pinout (refer to online help in AVR Studio®), and tools like the JTAGICE mkII can thus be connected directly to the header. If it is desired to use PDI programming/debugging an adapter must be used.

Table 3-1. XMEGA programming and debugging interface – JTAG and PDI.

J100 pin	JTAG ⁽¹⁾	PDI ⁽²⁾
J100-1	TCK	-
J100-2	GND	GND ⁽³⁾
J100-3	TDO	-
J100-4	VCC	VCC ⁽³⁾
J100-5	TMS	-
J100-6	nSRST	CLK
J100-7	VCC	VCC ⁽³⁾
J100-8	-	DATA
J100-9	TDI	-
J100-10	GND	GND ⁽³⁾

- Notes:
1. Standard pin-out for JTAGICE mkII and other Atmel programming tools.
 2. Requires adapter to connect a JTAGICE mkII (refer to AVR Studio help).
 3. It is only required to connect on VCC/GND pin.

The AT90USB1287 can be programmed through its bootloader. The bootloader is evoked by shorting the (PORTF4) pin to GND before applying power to the board. This can be done by shorting pin 1 and 2 on the J200 pin header with a jumper.

Alternatively, the AT90USB1287 can be programmed by connecting a programming tool, such as a JTAGICE mkII, to the "JTAG USB" pin header.

3.2 IO expansion headers

The XMEGA's analog PORTA is available on the "XMEGA PORT A" pin header (J101). This allows the user to connect external signals to the ADC, DAC and Analog Comparators on PORTA.





The XMEGA's digital PORTD is available on the "XMEGA PORT D" pin header (J102). This port features general purpose IO and various communication modules (USART, SPI and TWI).

Note that the communication modules on PORTD can be interconnected to test out various functions and features: The USART can loop back communication with a jumper, or communicate between the two UARTs on the PORT. The native SPI and the USART in SPI master mode can be connected, and the TWI module can be enabled in both master and slave mode at the same time to get loop back behavior (pull-up resistors required).

4 Attached Memories

The Xplain kit demonstrates how to use the External Bus Interface (EBI) module to interface a 4-bit SDRAM. An 8MB SDRAM (16M x 4) is attached in 3-port EBI mode (PORTH, PORTK and PORTJ).

An 8MB serial Dataflash® is connected to the UARTC1 which can operate in SPI master mode to interface the dataflash.

5 Miscellaneous IO

5.1 Micro switch buttons

Eight micro switch buttons are connected to the XMEGA's PORTF. Internal pull-ups should be enabled to detect when the buttons are pushed as they short the respective line to GND.

5.2 LEDs

Eight LEDs are connected to the XMEGA's PORTE. The LEDs are active low – and thus lights up when the respective lines are drawn low by the XMEGA.

5.3 Analog IO

An NTC and an adjustable resistor divider (potentiometer) are connected to PORTB on PINB0 and PINB1 respectively. These analog references can be used as input to the ADC.

An audio amplifier (and mono speaker) is connected to PORTB on PINB2. This pin is connected to the XMEGA's DAC and thus offers a way to generate sound.

6 Available code examples and drivers

Further information and drivers for XMEGA can be downloaded as application notes, also distributed from Atmel's web site.

7 Quick start guide

Power the Xplain kit by connecting it to a PC host or a USB power adapter. The Xplain USB connector is the mini-B type used for most portable products today.

If connecting the Xplain kit to a PC, it is required to install the Xplain USB device the first time it is connected. Please find the install file in the \software\USB driver\ folder

of the zip file distributed with this application note (www.atmel.com/avr). Select the driver corresponding to the Xplain/AT90USB1287 firmware revision used. It is possible to replace the AT90USB1287 firmware of a revision 1 kit with later firmware, in that case it is required to uninstall the USB driver and install the new driver.

The preprogrammed firmware in the ATxmega128A1 runs a demo application where sounds/tunes are played when the buttons are pushed.

Now, the objective for most users is to evaluate the ATxmega128A1... install AVR Studio and a compiler such as the WinAVR GCC compiler or the IAR Embedded Workbench compiler – and start writing code. To program and debug the code AVR development tools such as the JTAG ICE mkII or the AVRONE! can be used.

8 Revision history

Different revisions of the Xplain kit is released, these revisions are not fully identical it can therefore be relevant to identify the board used.

8.1 Revision 1

Revision 1 of the Xplain kit can be identified by **not** having a bar-code sticker on the back side.

Table 8-1. Xplain revision 1 – known issues.

Issue	Cause	Solution
Speaker is noisy during programming and debugging of the ATxmega128A1 when using JTAG.	Problem due to cross-talk contaminating the audio amplifier input.	Use the PDI interface or remove resistor R305.
AT90USB1287 cannot connect to FLIP programming software to reprogram the AT90USB1287 application section of the flash.	No bootloader programmed in the AT90USB1287	Upgrade to the AT90USB1287 with the latest firmware using an external programming tool such as the JTAG ICE mkII.
Default firmware for the ATxmega128A1 does not run correctly on revision 1 hardware.	The default firmware includes a production test, and since the dataflash is replaced the production test does not pass.	Program the firmware/binary for revision 1 hardware.

8.2 Revision 2

Revision 2 of the Xplain kit can be identified by a bar-code sticker on the back side with the following product ID: A09-0560/2.

Table 8-2. Difference between Xplain revision 1 and revision 2.

Difference	Comment
Dataflash changed to 45DB642D-CNU	The 45DB642D-CNU is replacing the 45DB041D-SU.
AT90USB1287 bootloader	Bootloader is entered by shorting pin 1 and 2 on the J200.
R305 removed	To eliminate noise on speaker during JTAG programming and debugging of the ATxmega128A1.
Two jumpers added – default placed on the J101 and J102.	For convenience of the end-user.



Headquarters

Atmel Corporation
2325 Orchard Parkway
San Jose, CA 95131
USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

International

Atmel Asia
Unit 1-5 & 16, 19/F
BEA Tower, Millennium City 5
418 Kwun Tong Road
Kwun Tong, Kowloon
Hong Kong
Tel: (852) 2245-6100
Fax: (852) 2722-1369

Atmel Europe
Le Krebs
8, Rue Jean-Pierre Timbaud
BP 309
78054 Saint-Quentin-en-
Yvelines Cedex
France
Tel: (33) 1-30-60-70-00
Fax: (33) 1-30-60-71-11

Atmel Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Product Contact

Web Site
<http://www.atmel.com/>

Technical Support
avr@atmel.com

Sales Contact
www.atmel.com/contacts

Literature Request
www.atmel.com/literature

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. **EXCEPT AS SET FORTH IN ATMEL'S TERMS AND CONDITIONS OF SALE LOCATED ON ATMEL'S WEB SITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

© 2009 Atmel Corporation. All rights reserved. Atmel®, Atmel logo and combinations thereof, AVR®, AVR Studio®, DataFlash® and others, are the registered trademarks, XMEGA™ and others are trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.