Atmel AVR1926: XMEGA-B1 Xplained Getting Started Guide

Features

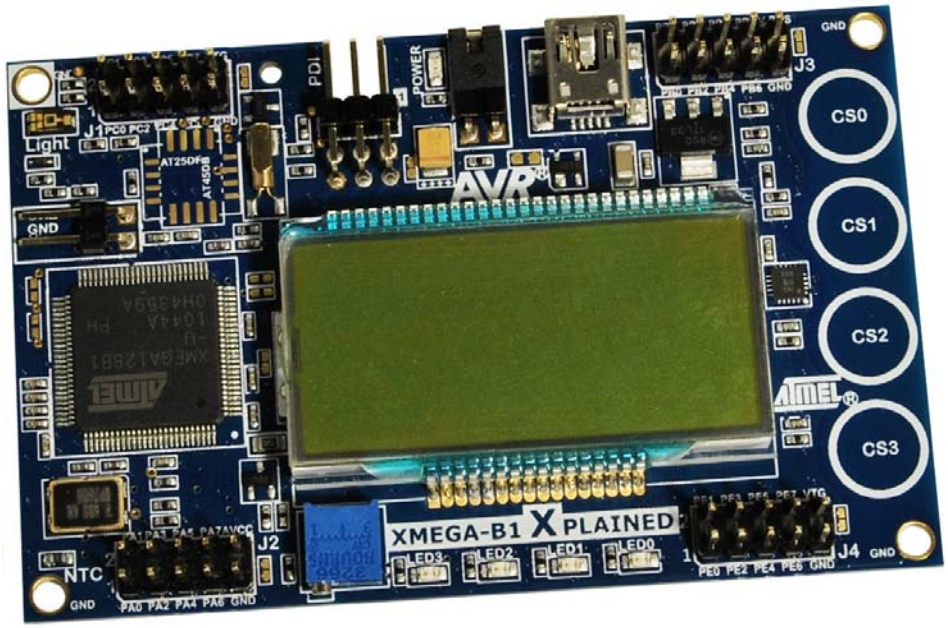
- **Easy to reprogram with just a USB cable and a preprogrammed boot loader**
- **Easy to debug code with PDI-based debugger/emulator**
- **Can be used with Atmel® AVR® STK®600, Atmel AVR JTAGICE 3, ATMEL AVR JTAGICE mkII, and Atmel AVR ONE!**

1 Introduction

The Atmel AVR XMEGA®-B1 Xplained evaluation kit is a hardware platform for evaluating the Atmel ATxmega128B1 microcontroller.

The kit offers a range of features that enable the Atmel AVR XMEGA user to get started using AVR XMEGA peripherals right away and understand how to integrate the AVR XMEGA device in their own design. This getting started guide will walk you through all the basic steps needed to start using the XMEGA-B1 Xplained evaluation kit.

Figure 1-1. XMEGA-B1 Xplained evaluation kit.



8-bit Atmel Microcontrollers

Application Note

Rev. 8439A-AVR-09/11

2 What is needed to get started?

To be able to run the preprogrammed code, you need the Atmel AVR XMEGA-B1 Xplained evaluation kit and a USB cable (Standard-A to Mini-B according to USB.org) to connect the board to a PC.

To modify the example code or to write new code and compile it, you need a toolchain for Atmel AVR microcontrollers and an integrated development environment (IDE) to edit and debug code. In Atmel AVR Studio® 5, Atmel provides an IDE and the Atmel AVR GNU Toolchain. Other IDEs and toolchains are also available, such as the IAR Embedded Workbench®.

If you also want to debug the code at runtime, you will need a debugger like the Atmel AVR JTAGICE 3, Atmel AVR JTAGICE mkII, or Atmel AVR ONE!. More information on these tools is available from the Atmel website. See the reference section later in this document for more details.

2.1 Documentation for XMEGA-B1 Xplained

The AVR1912: XMEGA-B1 Xplained Hardware User's Guide package includes all in-depth information about the kit, such as schematics, BOM, assembly drawings, 3D plots, and more. The package is available from the Atmel website:

www.atmel.com/xplained

2.2 Atmel AVR Software Framework

Integrated in AVR Studio 5 is the AVR Software Framework (ASF), a collection of production-ready source code, written and optimized by experts and tested in hundreds of production designs. Using these peripheral drivers, communication stacks and application-specific libraries is a quick and effortless way to complete a project. The ASF uses a set of standard Application Programming Interfaces APIs across all Atmel AVR microcontrollers. They simplify how your application code interfaces with chip peripherals and communication interfaces, ensuring that your application code migrates even easier across the whole range of AVR microcontrollers.

2.3 IDEs for Atmel AVR microcontrollers

2.3.1 AVR Studio 5

AVR Studio 5 is a free IDE for developing applications for all AVR microcontrollers. It offers an advanced editor as well as programming and debugging support.

Atmel AVR Studio 5 (free Atmel IDE)
www.atmel.com/avrstudio

2.3.2 Embedded Workbench for Atmel AVR

IAR™ Embedded Workbench is an integrated development environment with project management tools and editor.

IAR Embedded Workbench for Atmel AVR
http://www.iar.com/website1/1.0.1.0/107/1/

2.4 Toolchain

In order to build an application from the source code, a toolchain is needed, which includes required tools such as an assembler, compiler, and linker. The code for this kit is compatible with the Atmel AVR GNU and IAR AVR toolchains.

2.4.1 AVR Assembler 2

Integrated in Atmel AVR Studio 5 is the Atmel AVR assembler. The assembler works on source files containing instruction mnemonics, labels and directives. It generates fixed code allocations, consequently no linking is necessary.

2.4.2 AVR GNU Toolchain

Integrated in AVR Studio 5 is the AVR GNU toolchain extension. It includes all the necessary tools, such as C/C++ compiler, assembler and linker, for AVR application development.

AVR GNU Toolchain (free C/C++ compiler)
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=2725

2.4.3 IAR AVR Toolchain

This is a commercial toolchain that includes all the necessary tools, such as C/C++ compiler, assembler, and linker, for AVR application development. A 30-day evaluation version as well as a 4k (code size limited) kick-start version is available from the IAR website.

IAR Embedded Workbench for Atmel AVR
http://www.iar.com/website1/1.0.1.0/107/1/

2.5 Programmers and debuggers

Programmers and debuggers are needed when either the application is programmed without using the boot loader or when debugging support is needed. Several different tools are available that can be used directly with the Atmel AVR Xplained kit. The most common tools are described in the following chapters.

AVR Studio 5 manages all the following programmers/debuggers.

2.5.1 AVR JTAGICE 3

Atmel AVR JTAGICE3 is a mid-range debug/programming tool that can be used for programming and debugging of Atmel 8-bit and 32-bit AVR microcontrollers and kits including the Atmel AVR XMEGA-B1 Xplained kit.

AVR JTAGICE 3 (on-chip programming and debugging tool)
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=17213

2.5.2 AVR JTAGICE mkII

Atmel AVR JTAGICE mkII is a mid-range debug/programming tool that can be used for programming and debugging of Atmel 8-bit and 32-bit AVR microcontrollers and kits including the XMEGA-B1 Xplained kit.

AVR JTAGICE mkII (on-chip programming and debugging tool)
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=3353

2.5.3 AVR ONE!

Atmel AVR ONE! is a high-end debug/programming tool that can be used for programming and debugging of Atmel 8-bit and 32-bit AVR microcontrollers and kits including the Atmel AVR XMEGA-B1 Xplained kit.

AVR ONE! (on-chip programming and debugging tool)
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=4279

2.6 FLIP

Atmel FLIP (FLexible In-system Programmer) is a flexible PC-application which lets the user program and configure Atmel's microcontroller devices in-system. This is a serial-based ISP programming utility that uses a preprogrammed bootloader in the microcontroller. It allows the user to program hexadecimal files into the “Application Flash Section” or set the security bits.

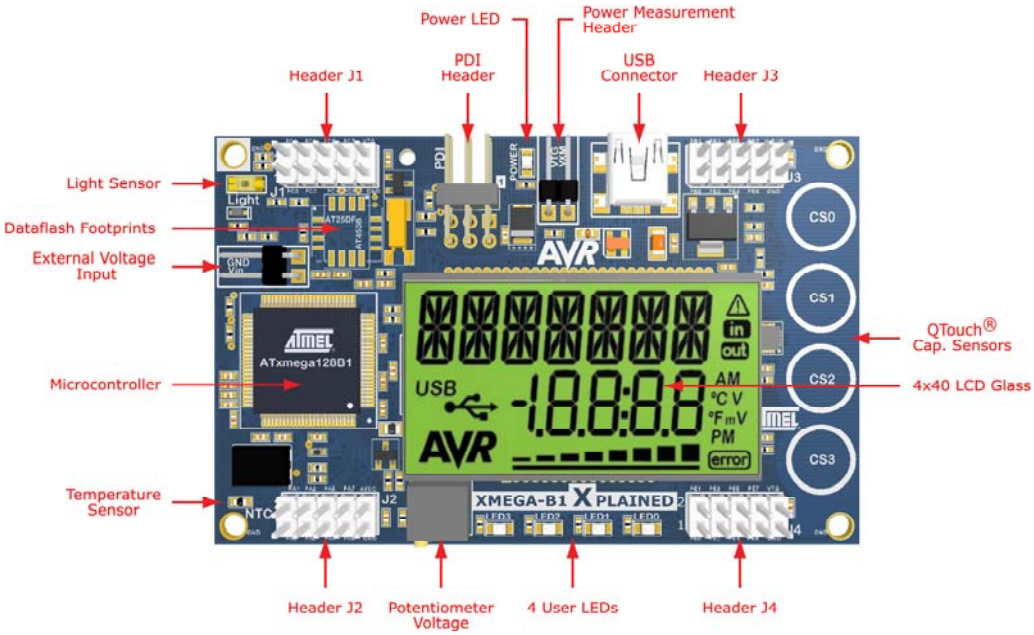
FLIP can be invoked from Atmel AVR Studio 5 as an external tool.

FLIP is available for free download from:
http://atmel.com/dyn/products/tools_card.asp?tool_id=3886

3 Board overview

Figure 3-1 shows the features available on the board. For more information on the Atmel AVR XMEGA-B1 Xplained hardware, take a look at the Atmel application note AVR1912: XMEGA-B1 Xplained Hardware User's Guide.

Figure 3-1. Overview of the XMEGA-B1 Xplained kit.



4 Connecting the board

4.1 Power

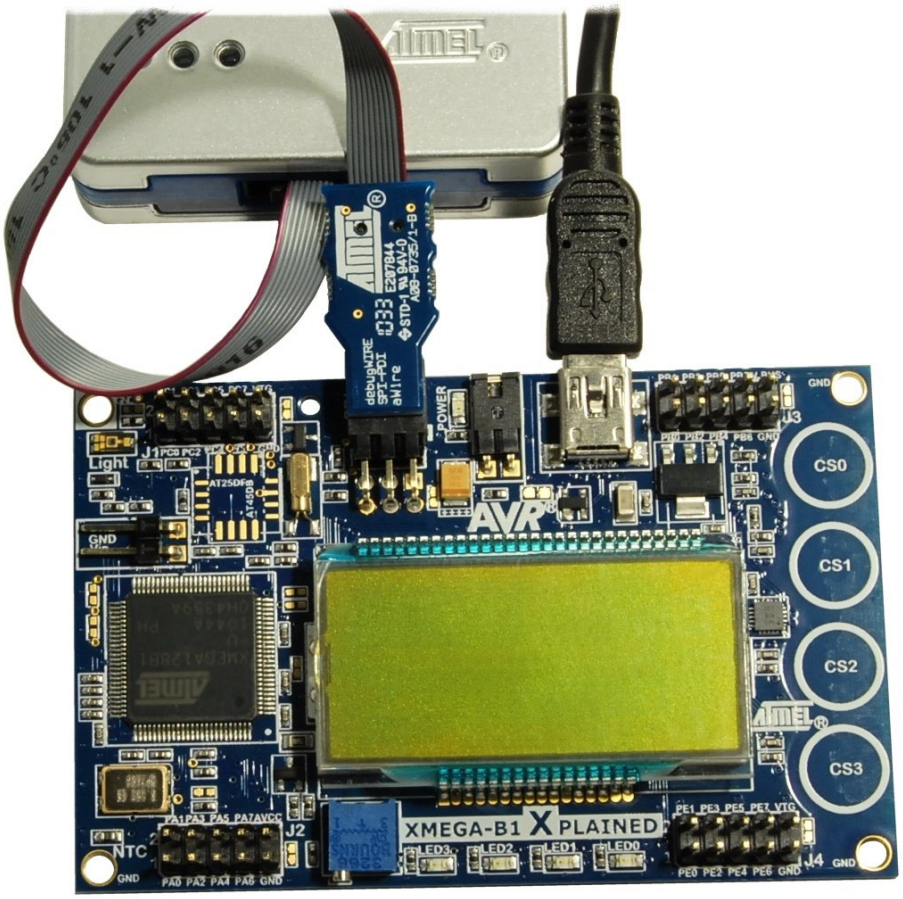
Connect a USB cable between the board and a PC or a USB power supply to power it up. That is all that is needed. When power is applied, the Power LED will light up green.

WARNING *Do not power the board without having the jumper attached next to the USB connector or an ammeter mounted. Otherwise, the device may be damaged by power sourcing through I/O pins. The power measurement header is located next to the USB connector, as shown in Figure 3-1.*

4.2 Connecting AVR JTAGICE 3

The dark blue PDI adaptor (ref. A08-0735) on the Atmel AVR JTAGICE 3 probe has to be used when connecting to the Atmel AVR XMEGA-B1 Xplained board. Take a look at Figure 4-1 to see how the connection should be made.

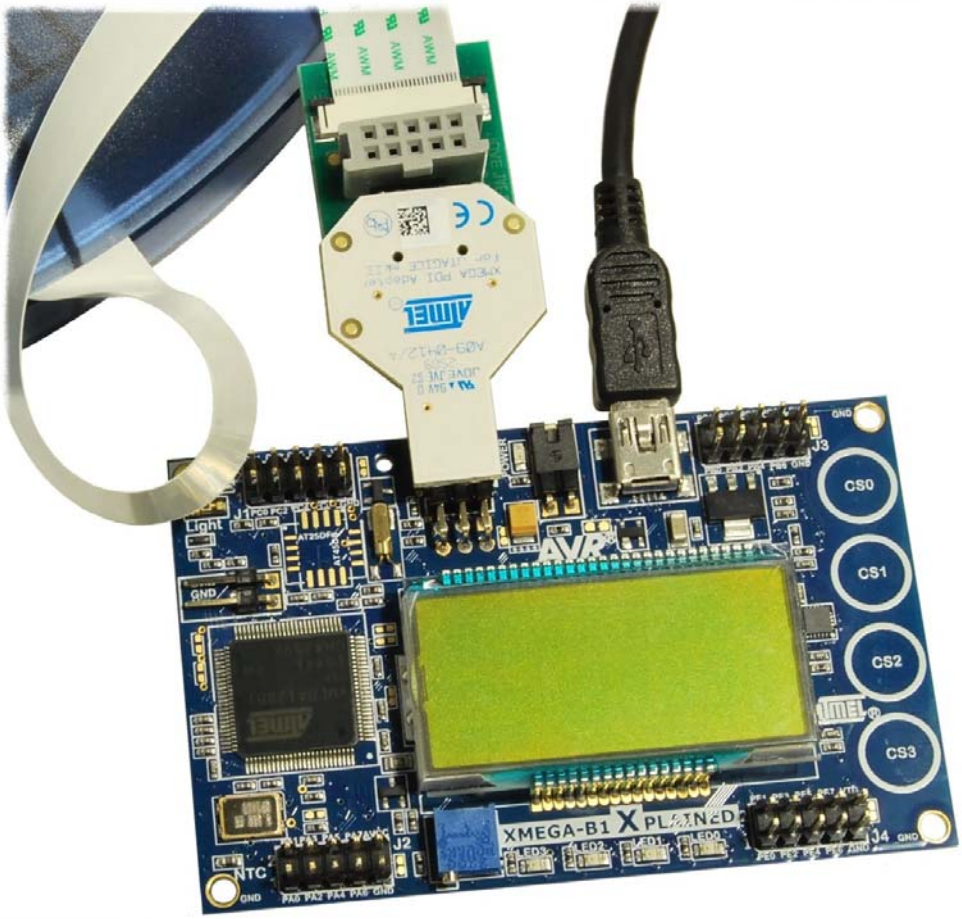
Figure 4-1. Connecting the AVR JTAGICE 3 to the XMEGA-B1 Xplained board.



4.3 Connecting AVR JTAGICE mkII

The grey connector on the Atmel AVR JTAGICE mkII probe has to be used when connecting to the Atmel AVR XMEGA-B1 Xplained board. See Figure 4-2 for reference on how to make this connection.

Figure 4-2. Connecting the AVR JTAGICE mkII to the XMEGA-B1 Xplained board.

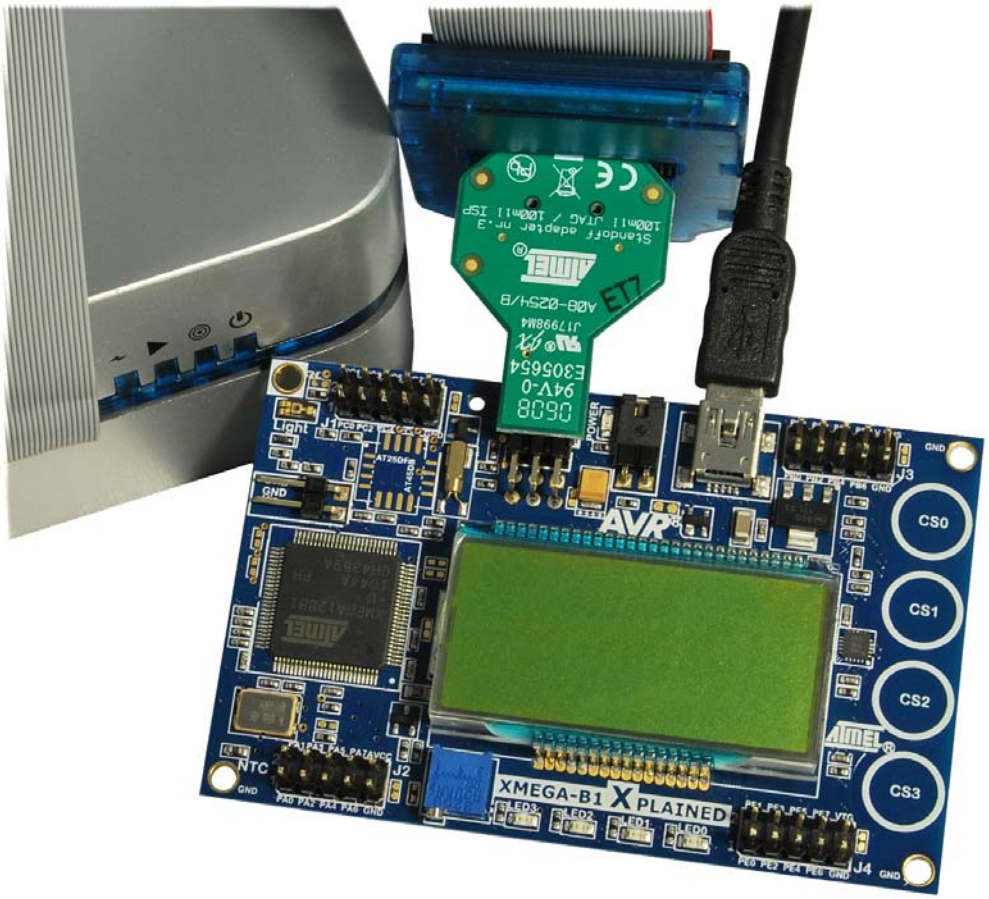


4.4 Connecting AVR ONE!

Standoff Adaptor nr.3 JTAG/ISP ref. A08-0254.

The green standoff adaptor nr.3 (ref. A08-0254) on the Atmel AVR ONE! probe has to be used when connecting to the XMEGA-B1 Xplained board as shown in Figure 4-3.

Figure 4-3. Connecting the Atmel AVR ONE! debugger to the Atmel AVR XMEGA-B1 Xplained board.



5 Programming the kit

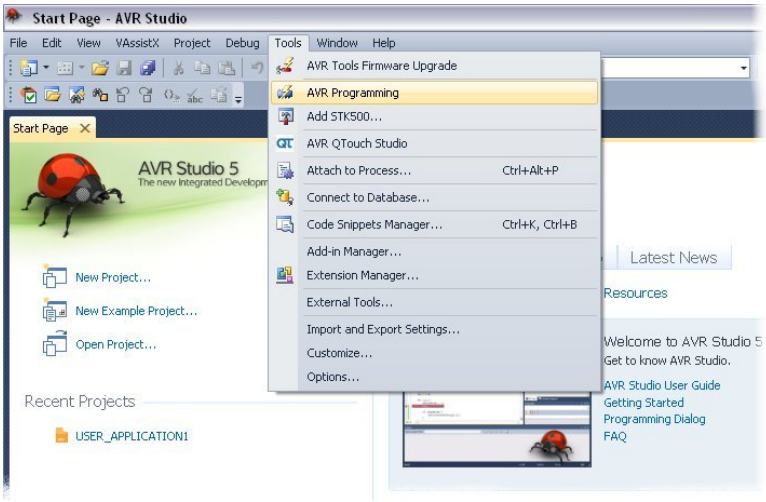
Both preprogrammed DFU boot loader and application software are provided in the Atmel AVR XMEGA-B1 Xplained kit.

To program your own application, two ways are proposed:

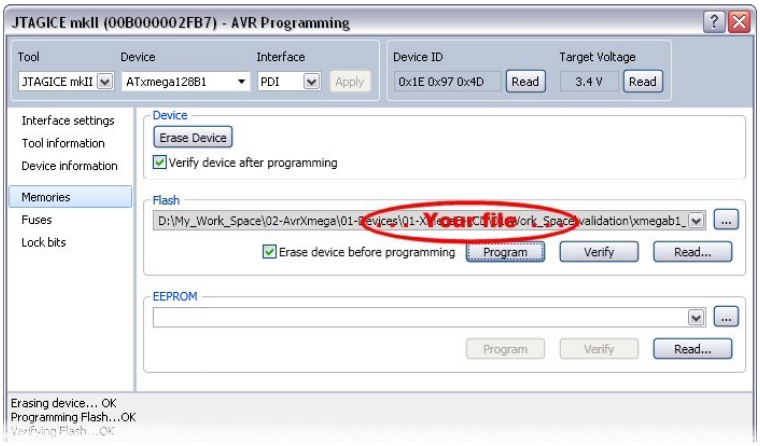
1. Programming via Atmel AVR Studio 5 and Atmel AVR tools.
2. Programming via the DFU boot loader.

5.1 Programming via AVR Studio tools

Invoke AVR Studio 5. Select “AVR Programming” in “Tools” menu.



Select your tool (ex: Atmel AVR JTAGICE mkII), Atmel ATxmega128B1 as device and PDI as interface then press “Apply”. Enter your file and then press “Program”.



WARNING *If a boot loader is flashed in the device (default configuration), this method of programming your application erases it.*
Before programming your application, the fuses configuration must be checked and changed if necessary, particularly the “BOOTRST” fuse that must be set to “APPLICATION”.

5.2 Programming via the DFU boot loader

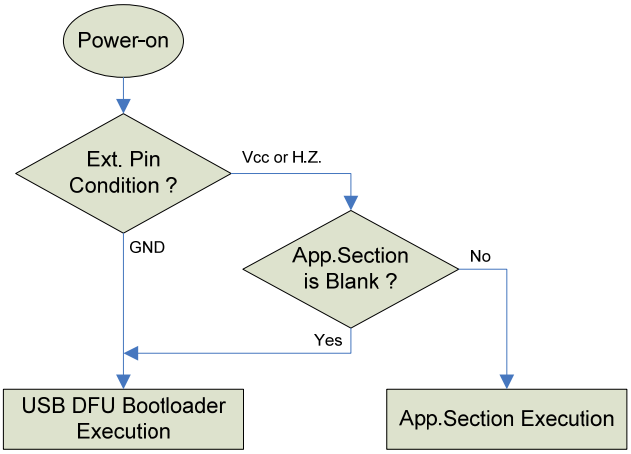
This method of programming allows the application and the boot loader to coexist.

The preprogrammed DFU boot loader is located in the “Boot Loader Flash Section” of the on-chip flash memory; it manages the USB communication protocol and mainly performs read/write operations to the on-chip memories (flash/EEPROM).

Two ways are available to evoke the boot loader on the Atmel AVR XMEGA-B1 Xplained board:

- *Automatic* if the “Application Flash Section” of the Atmel ATxmega128B1 is blank when power is applied
- *Forced* if pin 6 on J1 is shorted to GND when power is applied

Figure 5-1. USB DFU boot process.



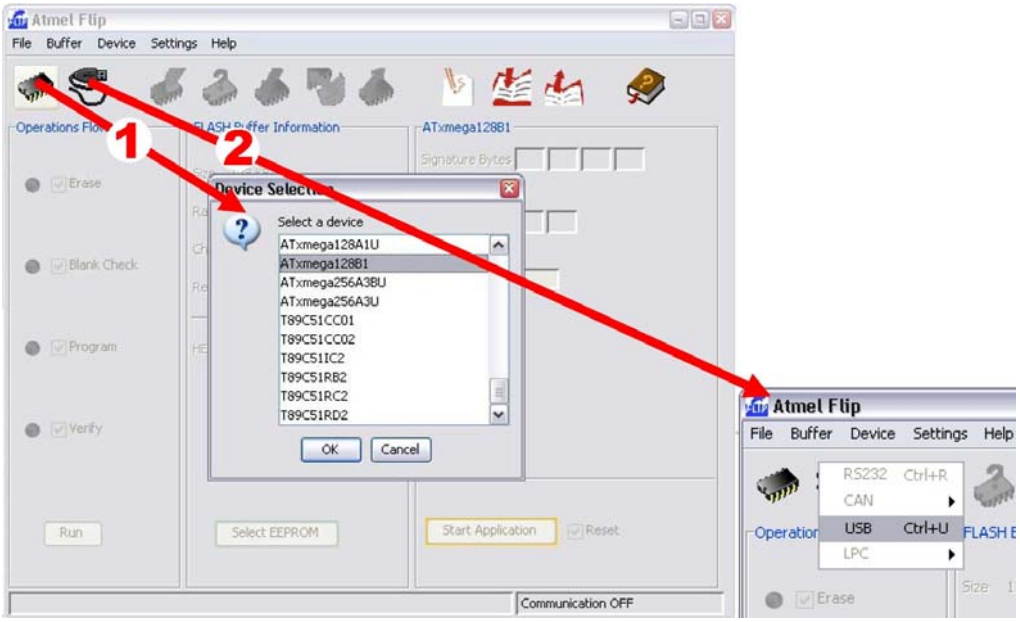
5.2.1 Prerequisite

To program the device, you need the DFU programming application Flip, which can be found under the FLIP installation directory.

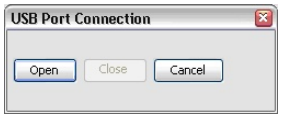
You need to install the most recent version (ver. ≥ 3.4.3).

5.2.2 Step-by-step guide

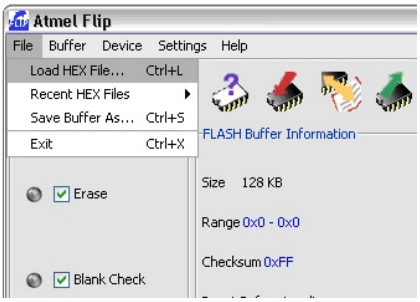
- Start Flip. This can be also done through the desktop “start” menu: “All Programs” -> . . . -> “Flip 3.4.3”
- Select “ATxmega128B1” from the device selection list available with the ‘chip’ icon
- Select “USB” as communication media (available with the “USB cable icon”)



- Open the USB port to connect to the target



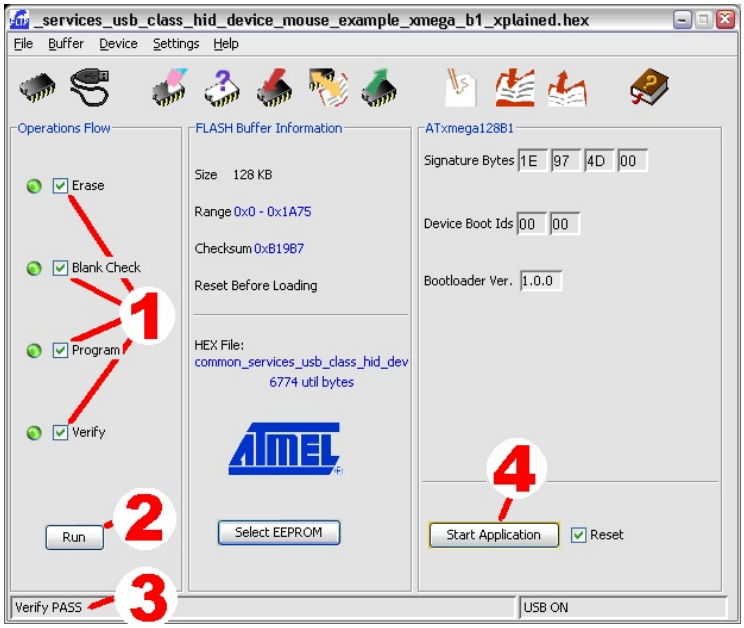
- Select the hexadecimal file to load



NOTE

The Atmel AVR XMEGA-B1 Xplained Demonstration hexadecimal file is available in the application note: AVR1619: XMEGA-B1 Xplained Demonstration.

- Select the '*Erase*', '*Blank Check*', '*Program*' and '*Verify*' operation check boxes. Then press the '*Run*' button.
  You should get confirmation in the bottom section of the window that the flash was successfully programmed and verified.
  Press '*Start Application*' button.



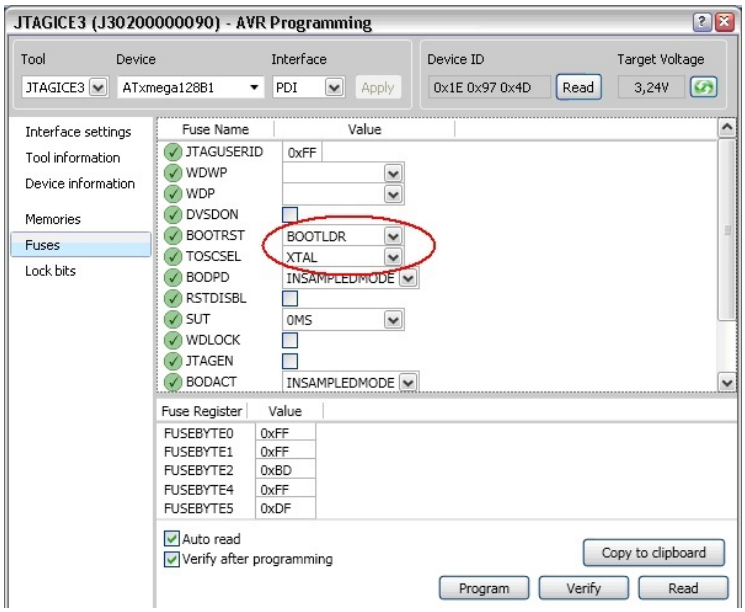
- Check that the application works (ex: a welcome message on the LCD)

5.2.3 Restoring the boot loader

When the boot loader has been erased, it can be restored with any of the previously mentioned AVR programming tools.

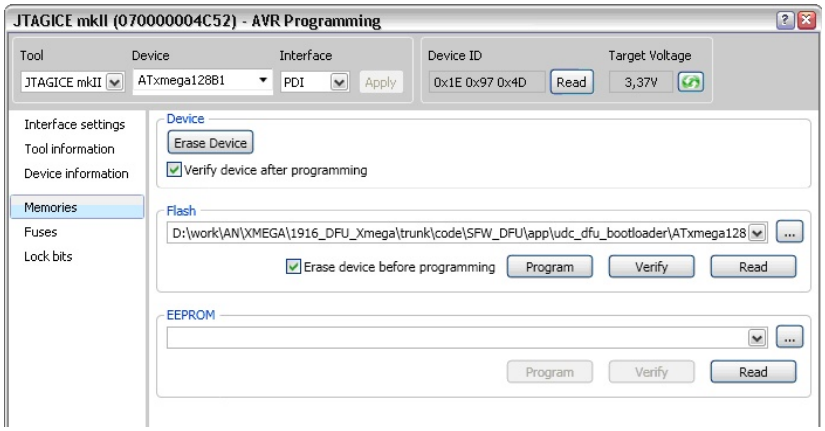
The Atmel ATxmega128B1 DFU boot loader hexadecimal file is available in the application note: AVR1916 - AVR ATxmega USB DFU Bootloader.

Figure 5-2. ATxmega128B1 fuses configuration.



NOTE The boot loader section is protected, and can only be erased with an external programmer.

Figure 5-3. Atmel ATxmega128B1 boot loader programming.



NOTE

You should get confirmation in the bottom section of the window that the flash was successfully programmed and verified.

6 Example applications

Several examples are available in ASF included in the Atmel AVR Studio 5: http://www.atmel.com/microsite/avr_studio_5/default.asp?category_id=163&family_id=607.

Each example has full source code with documentation to get started quickly. The examples can be compiled by using either GCC (included in AVR Studio 5) or IAR compilers.

6.1 Preprogrammed application firmware

The Atmel ATxmega128B1 microcontroller on the Atmel AVR XMEGA-B1 Xplained kit is preprogrammed with a USB bootloader and demonstration firmware.

The demonstration firmware offers a USB HID demonstration application that performs communication between a USB host application and XMEGA-B1 Xplained demonstration kit based on USB generic HID class implementation. It also performs ADC conversions and runs the LCD display.

“AVR1916: XMEGA-B1 Xplained Demonstration” application note.

6.2 More example projects and tutorials

For further exploration of the Atmel ATxmega128B1, please see the application notes that are applicable for the device. There are also several example projects and drivers available in the ASF modules for the Atmel AVR XMEGA A & B series.

For basic training to get familiar with the ATxmega128B1 device, Atmel application notes AVR1500 to AVR1510 are a good starting point. These application notes are available from the Atmel website:

http://www.atmel.com/dyn/products/documents.asp?category_id=163&family_id=607&subfamily_id=1965

7 References

Atmel AVR Xplained
http://www.atmel.com/products/AVR/xplain.asp?category_id=163&family_id=607

Atmel AVR Studio 5
http://www.atmel.com/microsite/avr_studio_5/default.asp?category_id=163&family_id=607

7.1 IAR Compiler

This is a commercial C/C++ compiler available for Atmel AVR 8-bit MCUs. A 30-day evaluation version as well as a 4k (code size limited) kick-start version is available from the IAR website:

IAR Embedded Workbench for Atmel AVR
http://www.iar.com/website1/1.0.1.0/107/1/

7.2 Atmel AVR Software Framework

This is a large library of drivers and code that is available for download and free use from the Atmel website:

AVR Software Framework (ASF)
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=4192&source=redirect

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