
AT09886: SAM L22 Getting Started Guide

APPLICATION NOTE

Introduction

This application note aims at helping the reader to get started with the Atmel® SAM L22 ARM® Cortex®-M0+ based Ultra low-power segment LCD microcontroller.

Atmel | SMART SAM L22 is a series of Ultra low-power segment LCD microcontrollers using the 32-bit ARM Cortex-M0+ processor, ranging from 48- to 100-pins with up to 256KB Flash and 32KB of SRAM and to drive up to 320 LCD segments. The SAM L22 devices operate at a maximum frequency of 32MHz and reach 2.14 Coremark/ MHz. With sophisticated power management technologies the SAM L22 devices run below 50µA/MHz in active mode and below 600nA in ultra-low-power backup mode with RTC.

SAM L22 is targeted for segment LCD and/or Battery powered applications, like sport watches, personal healthcare devices, thermostat with user interface, access control panels and metering (gas, water, energy metering, and basic smart meter) applications.

Features

- Getting started with Atmel SAM L22 microcontrollers
- Getting started with Atmel SAM L22 tools (Atmel SAM L22 Xplained PRO, Atmel Software Framework 3.26.10 or later, and Atmel Studio 6.2 or later)

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1. Configuration Summary

Table 1-1 Comparison Between SAM L22, SAM L21, and SAM D21 on page 3 shows the difference between SAM L22, SAM L21, and SAM D21 features. For more details, refer to the datasheet of the respective products.

Table 1-1 Comparison Between SAM L22, SAM L21, and SAM D21

Features	SAM L22N	SAM L22J	SAM L22G	SAM L21J	SAM L21G	SAM L21E	SAM D21J	SAM D21G	SAM D21E
Pins	100	64	48	64	48	32	64	48	32
GPIO(s)	82	50	36	51	37	25	52	26	26
Flash	256/128/64KB	256/128/64KB	256/128/64KB	256/128/64KB	256/128/64KB	256/128/64/32KB	256/128/64/32KB	256/128/64/32KB	256/128/64/32KB
Flash RWW section	8/4/2KB	8/4/2KB	8/4/2KB	8/4/2KB	8/4/2KB	8/4/2/1KB	2KB/ 1KB in 32KB and 64KB Flash variants	2KB/ 1KB in 32KB and 64KB Flash variants	2KB/ 1KB in 32KB and 64KB Flash variants
System SRAM	32/16/8KB	32/16/8KB	32/16/8KB	32/16/8KB	32/16/8KB	32/16/8/4KB	32/16/8/4KB	32/16/8/4KB	32/16/8/4KB
Low Power SRAM	-	-	-	8/8/4KB	8/8/4KB	8/8/4/2KB	-	-	-
Segment LCD (SLCD) Pins	48	31	23	-	-	-	-	-	-
Timer Counter (TC)	4	4	4	5	3	3	5	3	3
Timer Counter for Control (TCC)	1	1	1	3	3	3	3	3	3
DMA channels	16	16	16	16	16	16	12	12	12
USB interface	1	1	1	1	1	1	1	1	1
AES engine	1	1	1	1	1	1	-	-	-
Configurable Custom Logic (CCL) (LUTs)	4	4	4	4	4	4	-	-	-
True Random Generator (TRNG)	1	1	1	1	1	1	-	-	-
SERCOM	6	4	3	6	6	4	6	6	4
ADC channels	20	16	10	20	14	10	20	14	10
Analog Comparators	2	2	2	2	2	2	2	2	2
DAC Channels	-	-	-	2	2	2	1	1	1
Op-Amp	-	-	-	3	3	3	-	-	-
Tamper Input Pins	5	3	2				-	-	-
RTC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RTC alarms	1	1	1	1	1	1	1	1	1
External Interrupt lines	16	16	16	16	16	16	16	16	16
PTC channels for mutual capacitance	256 (16x16)	182 (13x14)	110 (10x11)	12x16 16x12	8x12 12x8	6x10 10x6	16x16	12x10	10x6
PTC channels for self capacitance	24	19	13	16	12	10	16	16	6
Maximum CPU frequency	32MHz	32MHz	32MHz	48MHz	48MHz	48MHz	48MHz	48MHz	48MHz
Packages	TQFP	QFN TQFP	QFN TQFP	QFN TQFP	QFN TQFP	QFN TQFP	QFN TQFP	QFN TQFP	QFN TQFP
Event System channels	8	8	8	12	12	12	12	12	12
SW Debug Interface	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

2. Getting the Device Datasheet

Web page: <http://www.atmel.com/products/microcontrollers/arm/sam-l.aspx?tab=documents>

Document: Atmel SAM L22 Datasheet (summary, complete) (.pdf)

Select the latest datasheet (.pdf file). There are two versions:

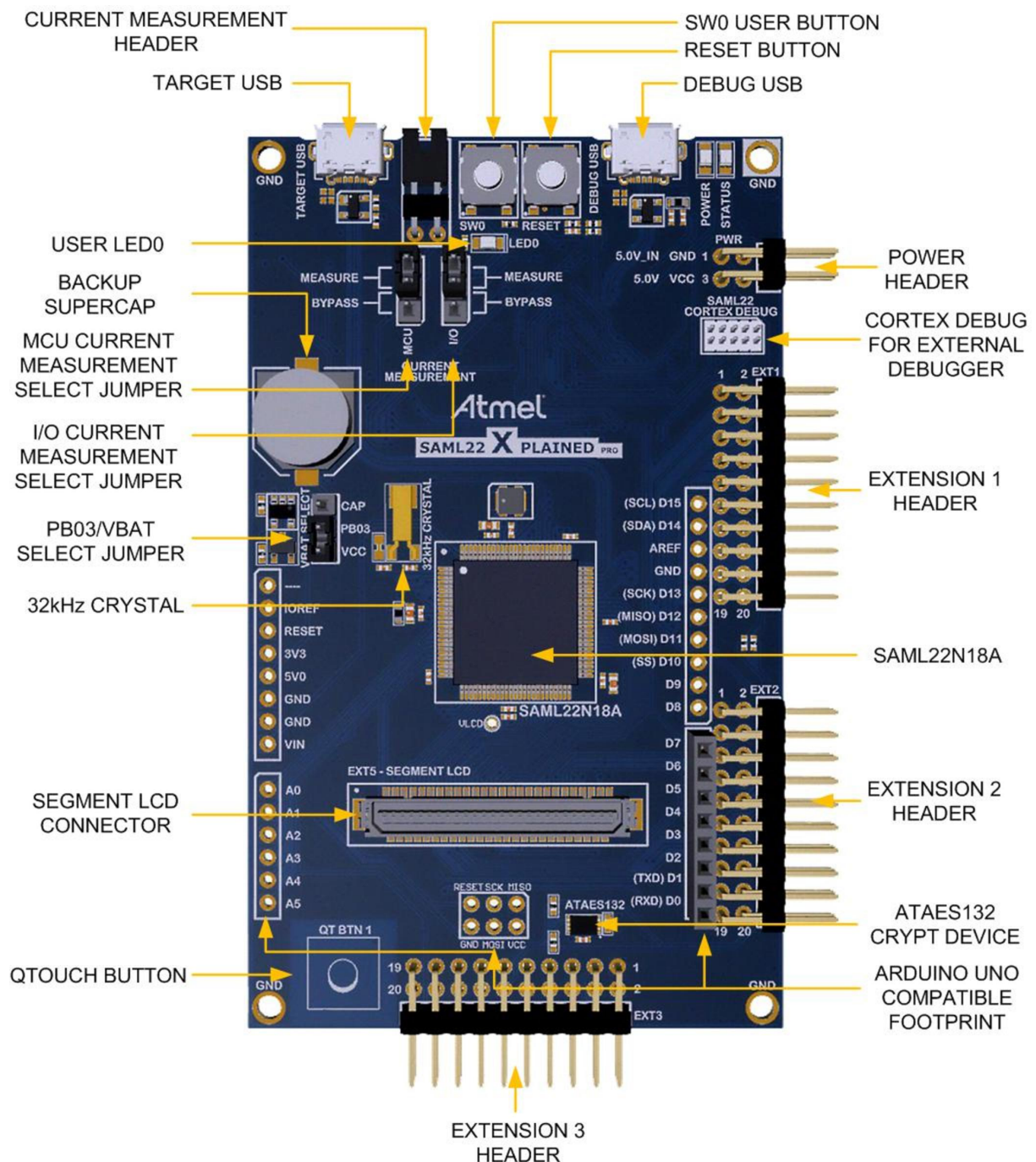
- Complete version (includes all peripheral descriptions and electrical characteristics)
- Summary version (includes Ordering Information, pinout and Packaging Information)

3. Get the SAM L22 Xplained Pro Evaluation Kit

Web page: <http://www.atmel.com/products/microcontrollers/arm/sam-l.aspx?tab=tools>

Get the kit: <http://store.atmel.com>

Figure 3-1 SAML22 Xplained Pro Picture



Document:

- SAM L22 Xplained Pro User Guide application note (.pdf) available in <http://www.atmel.com/tools/ATSAML22-XPRO.aspx?tab=documents>

Key features:

- ATSAML22N18A microcontroller
 - One mechanical reset button
 - One user button (wake-up, bootloader entry or general purpose)
 - One Yellow user LED (LED0)
 - USB Device interface function
 - One QTouch[®] Button
 - Segment LCD connector with additional lines for touch
 - ATAES132 Crypto Authentication
 - 32.768kHz crystal
 - Standard Cortex Debug connector
 - 3 Xplained Pro extension headers (EXT1, EXT2, and EXT3)
 - USB powered
 - Supported with application examples in Atmel Software Framework
 - Embedded Debugger
 - Auto ID for board identification in Atmel Studio 6.2
 - Programming/debugging of target via SWD
 - Data gateway interface to target (SPI & TWI)
 - Four GPIOs connected to target
 - One yellow EDBG status LED
 - One green board power LED (controlled by EDBG)
 - Virtual COM-port interface via UART
 - Embedded current measurement circuitry, with Atmel Data Visualizer support for data visualization
 - Arduino extension footprint
- The SAM L22 Xplained Pro User Guide application note covers how to power the kit, the detailed information of the on board components, extension interface and the hardware guide.

4. Get the Tools

Atmel Studio 6.2 is the preferred IDE to get started with the SAM L22 device and GCC compiler. Atmel Software Framework (ASF) provides SAM L22 peripheral drivers and example projects. IAR™ compiler is supported as well.

4.1. Get Atmel Studio 6

Web page: www.atmel.com/atmelstudio

Document/ file:

- Atmel Studio 6.2 installer (.exe)

Atmel Studio 6.2 is the IDE for developing and debugging firmware for the SAM L22 microcontroller.

4.2. Get IAR Embedded Workbench for ARM

Web page: <http://www.iar.com/en/Products/IAR-Embedded-Workbench/ARM/>

Document/file:

- IAR installer for ARM

4.3. Get SAM L22 Xplained Pro Embedded Debugger Software (Segger J-Link)

Web page: <http://www.segger.com/jlink-software.html>

Document/file:

- J-Link software

This software is required to program/debug the SAM L22 Xplained Pro embedded debugger with IAR IDE.

4.4. Get Atmel Software Framework (ASF)

Web page: www.atmel.com/asf

Document/file:

- ASF update for Atmel Studio (.vsix) from ASF web page
- ASF update through Atmel Gallery <https://gallery.atmel.com/> for version 3.26.10 and above
- ASF update through Tools>Extension Manager from Atmel Studio
- ASF standalone package for GCC makefile and IAR users
- ASF: Getting started (.pdf)
- ASF: Reference Manual (.pdf)
- ASF online documentation for available API and examples can be found at <http://asf.atmel.com>

4.5. Atmel Studio 6.2 Users Getting Started

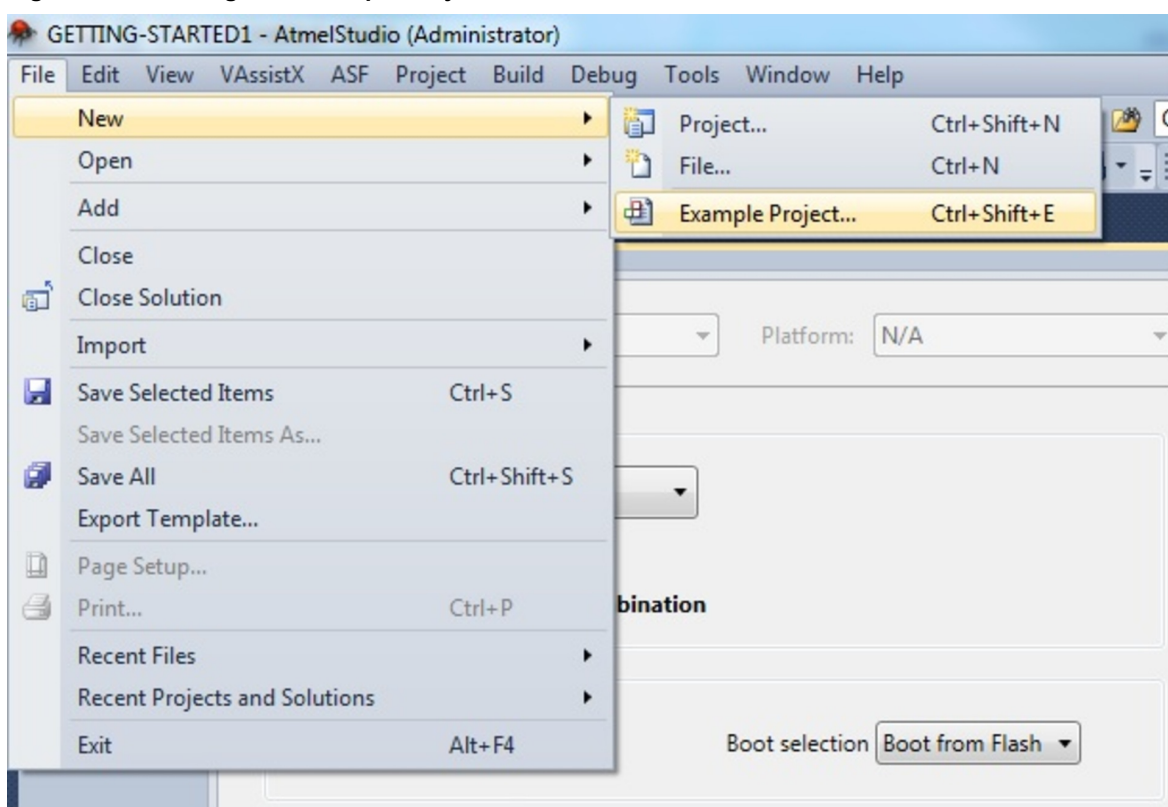
Prerequisites:

- Atmel Studio 6.2 SP2 or above installed
- ASF version 3.26.10 or above installed
- SAM L22 Xplained Pro board connected to PC through embedded debugger USB connector. The kit is powered through USB.

Getting started with Atmel Studio 6.2, ASF, and SAM L22 Xplained Pro:

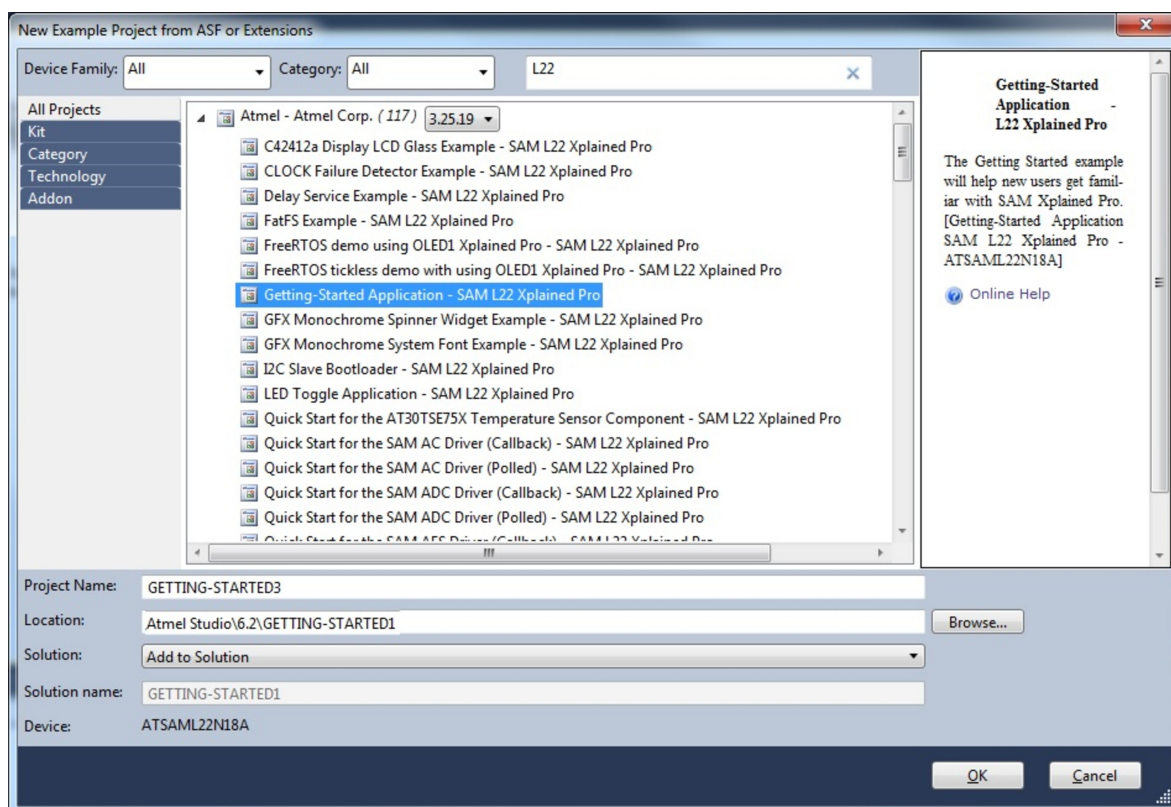
- Launch Atmel Studio 6.2
- Connect the SAM L22 Xplained Pro board to the PC using a USB cable
- A page on SAM L22 Xplained Pro description will open in Atmel Studio
- This page contains external link to Device Technical Documentation, Datasheet, Kit user guide, and Kit specific details like serial number and target name. Also, there will be an option to open ASF example projects.
- To open ASF examples, click File-> New -> then Example Project.

Figure 4-1 Creating New Example Project in Atmel Studio



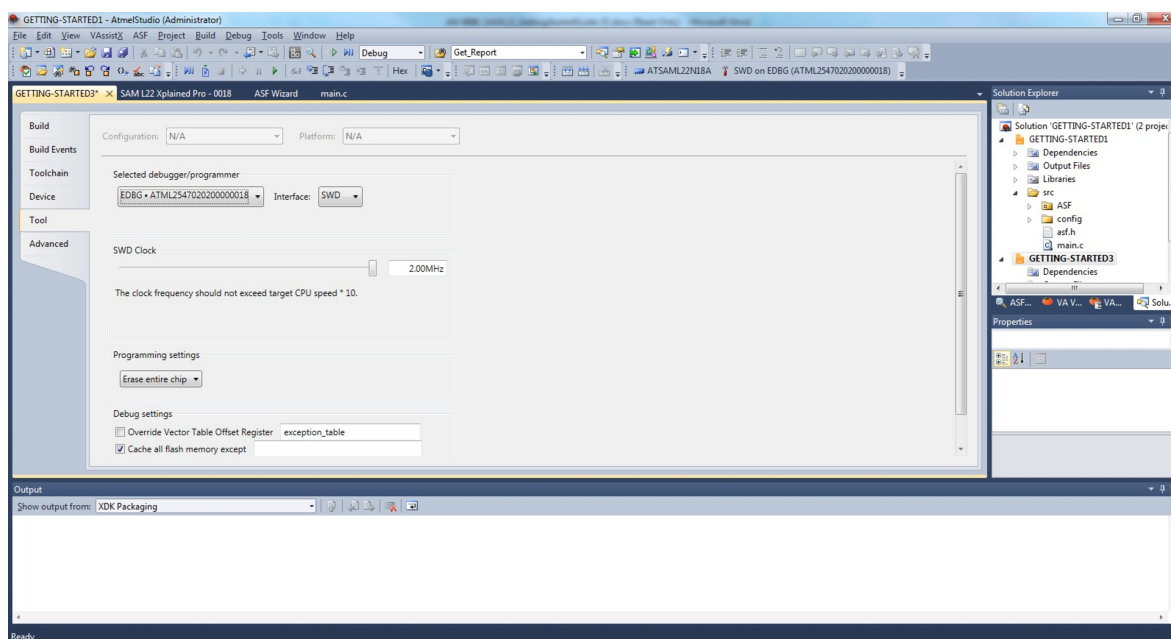
- Select 'Getting started application-SAM L22 Xplained Pro' as shown in [Figure 4-2 SAML22 Getting started Project Selection](#) on page 9, press OK and accept the license agreement. Then the project will be created and opened

Figure 4-2 SAML22 Getting started Project Selection



- Open project properties (Project -> Properties or shortcut Alt+f7)
- In Tool view, set 'Select debugger/programmer' to XPRO-EDBG and interface to SWD as shown in [Figure 4-3 SAML22 Atmel Studio – Tools Configuration](#) on page 9

Figure 4-3 SAML22 Atmel Studio – Tools Configuration



- Build the project: Build -> Build solution or shortcut F7

- To load the code in the SAM L22 Xplained Pro and debug, select Debug -> Start debugging and break (shortcut Alt + F5)
- The application is programmed and the debugger breaks in main
- To run the code, select Debug -> Continue (shortcut F5)
- On the computer, open and configure a terminal application (e.g. HyperTerminal on Microsoft® Windows® or Terminal application is available as an addon to Atmel Studio) with these settings:
 - 38400 bauds
 - 8 bits of data
 - No parity
 - 1 stop bit
 - No flow control
- Start the application
- The LED should start blinking on the board. In the terminal window, the following text should appear (values depend on the board and chip used):
 - \code
 - Getting Started Example xxx --
 - xxxxxx-xx
 - Compiled: xxx xx xxxx xx:xx:xx --
 - \endcode
- **Figure 4-4 SAML22 Getting Started – Terminal Output**

```

COM24:38400baud - Tera Term VT
File Edit Setup Control Window Help
-- Getting Started Example --
-- SAML22_XPLAINED_PRO --
-- Compiled: Jul 17 2015 17:18:09 --
-- Pressing and release button SW0 should make LED0 on and off --
The output is triggered by IC counter
The output is triggered by IC counter
The output is triggered by IC counter

```

- Pressing and release button SW0 should make LED0 on and off blinking.

5. What's Next?

- Atmel Studio videos: www.atmel.com/atmelstudio
- Atmel Studio help: Help -> View Help (Ctrl+F1)
- ASF Getting Started: www.atmel.com/asf
- ASF online documentation: <http://asf.atmel.com/docs/latest/>
- ASF Reference manual: <http://www.atmel.com/tools/AVRSOFTWAREFRAMEWORK.aspx?tab=documents>
- Technical Documentation for various products: www.atmel.no/webdoc
- Technical Support: <http://www.atmel.com/design-support/>

6. Revision History

Doc Rev.	Date	Comments
42494A	08/2015	Initial document release.



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