

Atmel® CryptoAuth Xplained Pro Extension Board

## Introduction

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The Atmel® CryptoAuth Xplained Pro (CAXPro) Evaluation Kit is an extension add-on board that can be used with a selection of Atmel ARM® microcontrollers. The Atmel CryptoAuthentication™ evaluation board supports the Atmel ATSHA204A, ATECC508A, and ATAES132A crypto element devices (crypto devices) in embedded design applications. The CAXPro has been developed to allow fast system prototyping within the ARM Xplained Pro development environment. This kit gives engineers, developers, and decision makers a tool to understand the device architecture and its uses for product authentication, confidential file protection, perform two-factor logons, or prevent software piracy.

When connected to an ARM microcontroller and used with the Atmel Studio Framework (ASF), the CAXPro will automatically detect the microcontroller type and automatically pull in the associated software to support the crypto devices in embedded design applications.

The CAXPro allows fast system prototyping within the Atmel ARM Xplained Pro development environment. It is a tool for engineers, developers, and decision makers to assist in understanding the crypto device's architecture and its uses for product authentication, confidential file protection, two-factor logons, and software piracy prevention.

Complete support for the CAXPro is available at [www.atmel.com/cryptokits](http://www.atmel.com/cryptokits).

## Kit Contents

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- (1) Atmel CryptoAuth Xplained Pro Evaluation Extension Board

## Kit Features

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- Crypto Authentication Devices
  - Atmel ATSHA204A CryptoAuthentication IC: TWI (0xC8)
  - Atmel ATECC508A CryptoAuthentication IC: TWI (0xC0)
  - Atmel ATAES132A CryptoAuthentication IC: TWI (0xA0)
- Atmel Standard XPRO Extension Header
- Atmel Identification IC: SWI Used for Atmel Studio Framework (ASF) Identification.
- Extension Header Connection (connect additional extension devices)

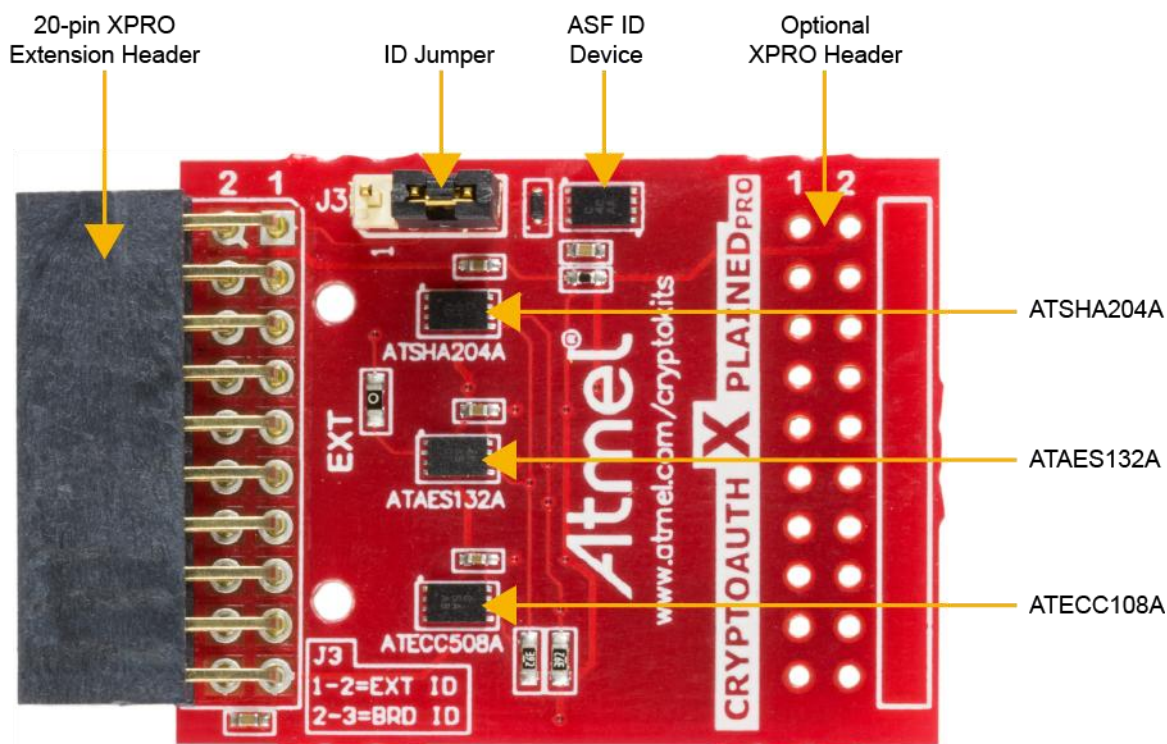
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## Board Overview

Figure 1. CryptoAuth Xplained Pro Extension Board



### Optional XPRO Header

CAXPro optionally allows an additional XPRO male header to be mounted which allows additional extensions such as a WIFI module or smart sensor. All XPRO connections pass through from one port to the other with the exception of the ID signal. The ID Jumper is used to select which of the two boards will be identified by ASF. The default position shown in Figure 1 selects the CAXPro board ID Chip.

### Atmel Studio Framework (ASF) ID Device

All Xplained Pro compatible extension boards have an Atmel ATSHA204A crypto authentication 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 via the SWI over the ID signal. For the board to be detected the ID jumper must be connected as shown in Figure 1. Once connected to ASF, this board will be identified as a CAXPro extension board. It will load the appropriate:

- Atmel CryptoAuthentication example projects and software libraries.
- Example projects and software libraries associated with the attached microcontroller board.
- Relevant Technical Documentation

The following table details the information stored on the ID Device.

**Table 1. ID Device**

Data Field	Data Type	Example Content
Manufacturer	ASCII String	Atmel\0'
Product Name	ASCII String	CryptoAuth Xplained Pro\0'
Product Revision	ASCII String	03\0'
Product Serial Number	ASCII String	2504030200000010\0'
Minimum Voltage [mV]	uint16_t	2000
Maximum Voltage [mV]	uint16_t	5500
Maximum Current [mA]	uint16_t	30

## XPRO Extension Header

The XPRO extension header is the standard header used with all of the Atmel Xplained Pro boards. All microcontroller boards have one or more 20-pin male extension header, and all XPRO extension boards have a 20-pin female header. The connector pinout is defined below and lists how the signals are connected to the optional extension header.

**Table 2. XPRO Header Pinout**

Pin	Default XPRO Signal Name <sup>(1)</sup>	CryptoAuth-XPRO Signal Name	Optional Header	Comment
1	ID	ID	No	To connect to ID of optional extension board, place the jumper in position one and two.
2	GND	GND	Yes	
3	ADC(+)	N/A	Yes	
4	ADC(-)	N/A	Yes	
5	GPIO1	AES-AUTH0	Yes	If AES_AUTH0 not needed, it can be disconnected via zero $\Omega$ resistor.
6	GPIO2	N/A	Yes	
7	PWM(+)	N/A	Yes	
8	PWM(-)	N/A	Yes	
9	IRQ/GPIO	N/A	Yes	
10	SPI_SS_B/GPIO	N/A	Yes	
11	I <sup>2</sup> C SDA	I <sup>2</sup> C SDA	Yes	Since I <sup>2</sup> C multi-drop bus additional I <sup>2</sup> C devices can be connected to optional extension board.
12	I <sup>2</sup> C SCL	I <sup>2</sup> C SCL	Yes	
13	USART_RX	N/A	Yes	
14	USART_TX	N/A	Yes	
15	SPI_SS_A	N/A	Yes	
16	SPI_MOSI	N/A	Yes	
17	SPI_MISO	N/A	Yes	
18	SPI_SCK	N/A	Yes	
19	GND	GND	Yes	
20	V <sub>CC</sub>	V <sub>CC</sub>	Yes	

Note: 1. Typically all signals on the XPRO connector can be configured as GPIOs.

## Getting Started

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The CAXPro should be paired with an Atmel microcontroller or development kit which supports the standard XPRO header interface. In addition, the associated crypto software libraries are required. Please visit the Atmel website at <http://www.atmel.com/cryptokits> under the Software Library headings.

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### Step 1 Identify the Paired Microcontroller/Development Kits

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Identify which microcontroller and features are required to support the overall project needs. Note that choosing an Atmel microcontroller will have a much higher level of support available. Various tools are available on the Atmel Website to help select the microcontroller that matches the projects needs.

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### Step 2 Identify other Required Atmel Extension Boards

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Atmel provides a wide range of extension boards that connect to standard Atmel microcontroller development platforms. Multiple extensions can be supported on platforms that have multiple XPRO extension interfaces. Atmel provides a bread boarding extension which is used for system development. CAXPro provides an expansion header so an additional extension board can be connected.

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### Step 3 Install the Atmel Studio Framework (ASF)

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Atmel XPRO extension and development kits are integrated into the ASF. The ID chips on the main development board and extension headers allow ASF to identify example projects and software that can be helpful to a developer in starting their software development.

The latest version of ASF is located at:

<http://www.atmel.com/tools/AVRSOFTWAREFRAMEWORK.aspx>

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### Step 4 Assemble the Hardware

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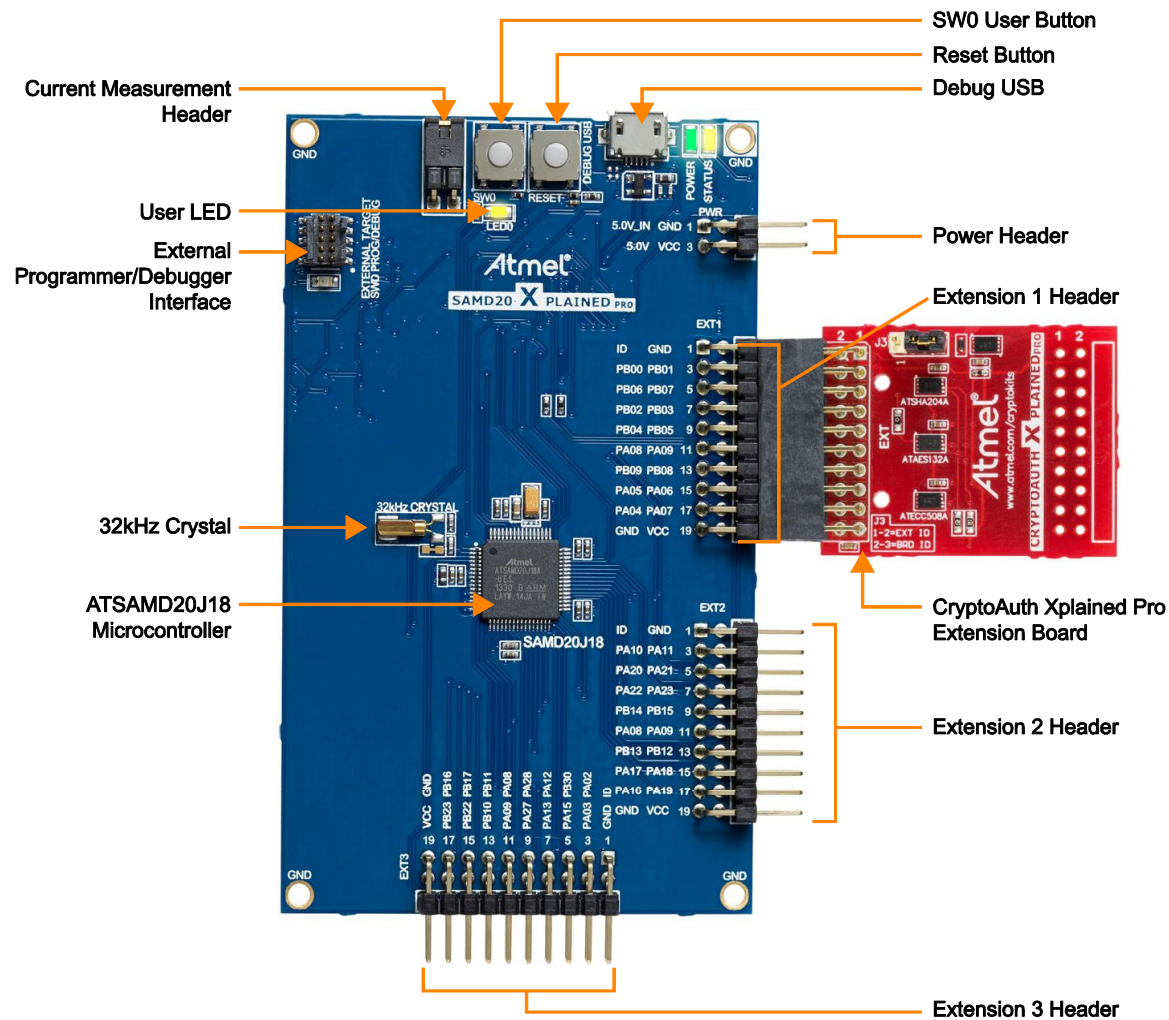
1. Connect the various Xplained Pro development extensions to the main Atmel microcontroller development board. Note that most development boards can be powered either through the USB port or via an external supply.
2. Connect the USB Cable between the PC that will run ASF and the EDBG debugger port of the microcontroller. Connecting to the EDBG port allows access to the ID chips on the various boards.

A complete list of XPRO boards can be located at:

<http://www.atmel.com/products/microcontrollers/avr/xplained.aspx>



**Figure 2. SAMD20 with Atmel CryptoAuth Xplained Pro**



## Step 5 Initiate Atmel Studio Framework (ASF)

Once the hardware is connected and the USB cable is connected to the PC, ASF can be initiated. The first thing ASF does is to scan for the software of the connected microcontroller development kit and extensions. The ASF environment identifies the extensions and provides software examples to facilitate in getting started with the combined development kits.

## Step 6 Select Example Project and Begin Programming

When ASF opens, it initially identifies the microcontroller board and all extension boards connected to the microcontroller board. From this, an example project can be selected. The various code components are grouped together and an initial project can be created. Creation of a new project can then begin.

## Crypto Authentication Software Libraries

Atmel provides a variety of software libraries for use with Crypto Authentication products. Some of these will get incorporated into an ASF project when the CAXpro hardware is connected to the ASF development environment. Additional libraries and example projects will be added over time.

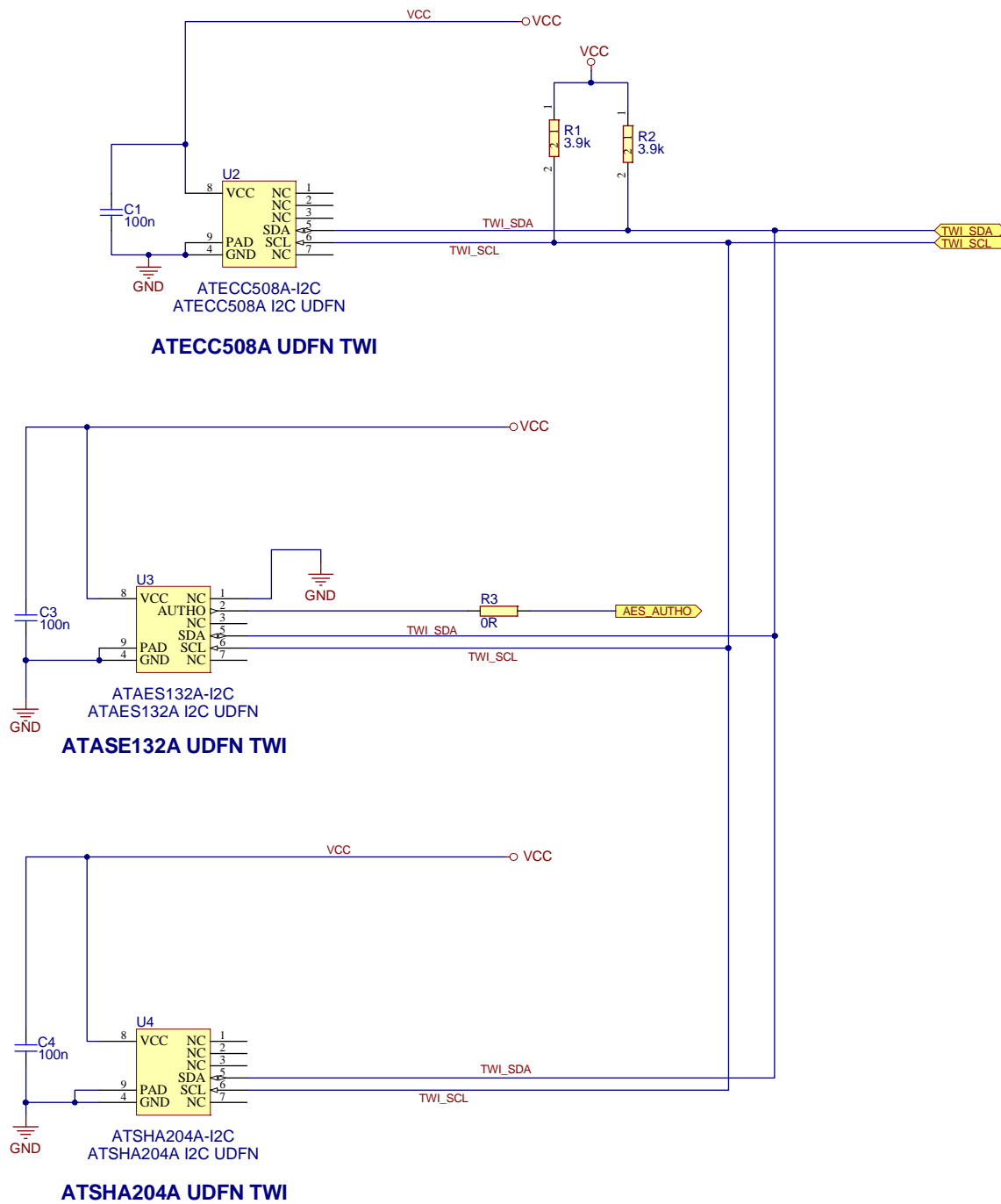
**Table 3. Atmel CryptoAuthentication Libraries**

Library	Device Project Development Support
CryptoAuthentication ATSHA204A Development Library	ATSHA204A
CryptoAuthentication ATECC108A/508A Development Library	ATECC108A and ATECC508A
CryptoAuthentication ATAES132A Development Library	ATAES132A
Atmel Crypto Authentication Library (ATCALIB)	Atmel CryptoAuthentication devices and is integrated into ASF.

For more information on the software libraries please go to: <http://www.atmel.com/cryptokits> and look under the heading of software libraries.



# CryptoAuth Xplained Pro Schematics



## Revision History

Doc Rev.	Date	Comments
8893A	09/2015	Initial document release.



**Atmel Corporation** 1600 Technology Drive, San Jose, CA 95110 USA T: (+1)(408) 441.0311 F: (+1)(408) 436.4200 | [www.atmel.com](http://www.atmel.com)

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.