Atmel QTouch

# Touch SLCD1 Xplained Pro

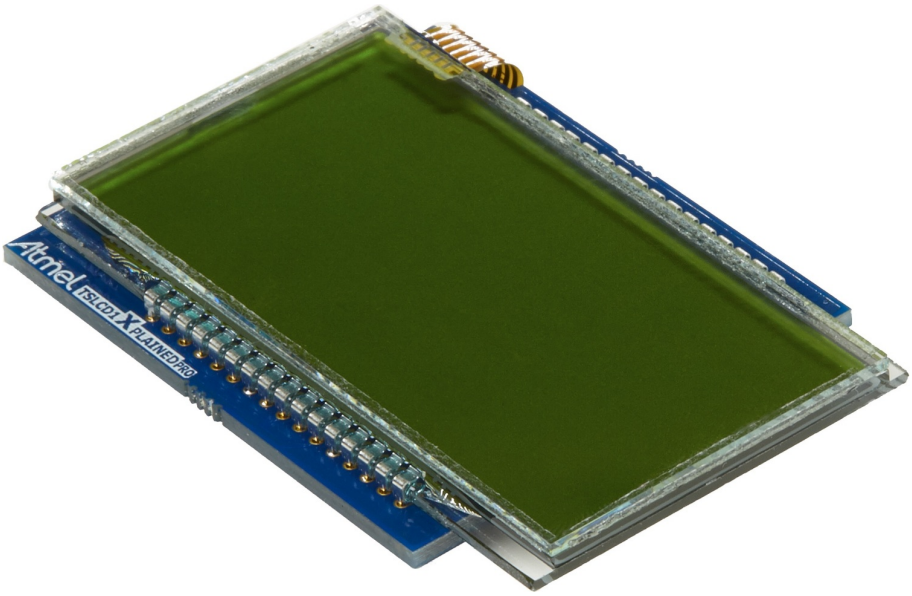
**USER GUIDE**

## Preface

The Atmel® Touch SLCD1 Xplained Pro is an extension for the Atmel Xplained Pro platform.

The kit offers a segment LCD display with 8x24 segments (179 usable segments) and five on-glass mutual capacitance touch sensors for evaluation with the Peripheral Touch Controller (PTC) module.

Touch SLCD1 Xplained Pro is designed to make it easy to start segment LCD development with Atmel microcontrollers that supports segment LCDs.



# Table of Contents

# 1. Introduction

## 1.1. Features

- Custom segment LCD with 179 individually controllable segments
  - 8 common x 24 segment lines
  - Eight 14-segment alphanumeric characters
  - Five and a half 7-segment characters with delimiters
  - Four stage wireless signal indicator
  - Four stage battery indicator
  - AM, PM, Celsius, Fahrenheit, m, µ, V, A, USB, and Atmel logo indicators
  - Five arrows with mutual capacitance touch overlay
- Xplained Pro hardware identification system

## 1.2. Kit Overview

Atmel Touch SLCD1 Xplained Pro extension board is a small circuit board, with a custom touch segment LCD display, that is compatible with Xplained Pro MCU boards with a segment LCD connector.

**Figure 1-1 Touch SLCD1 Xplained Pro Top Overview**

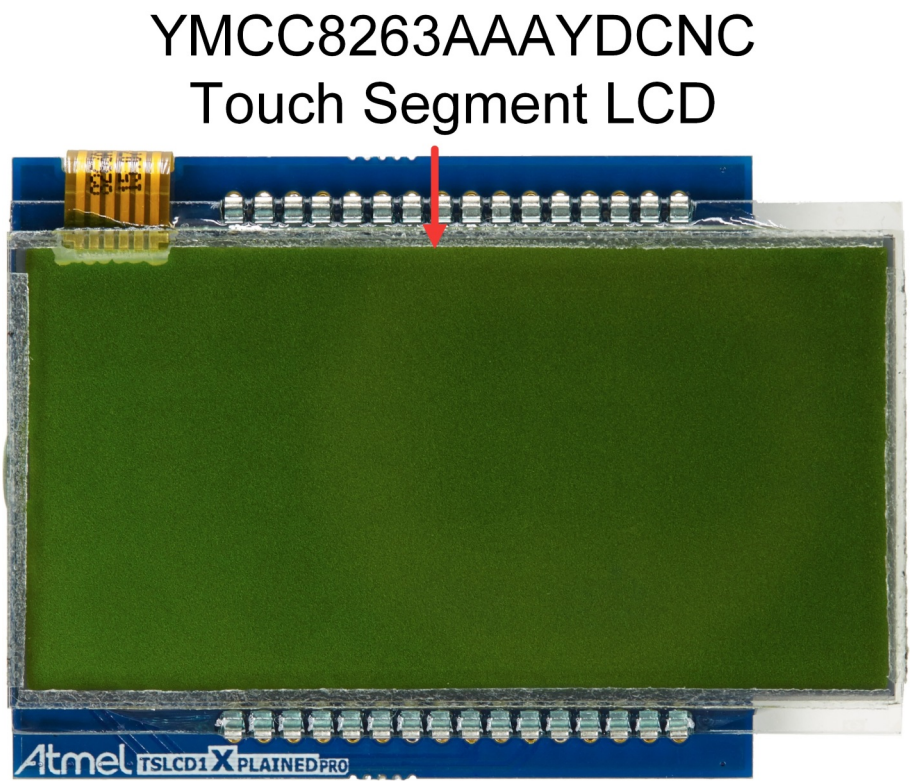
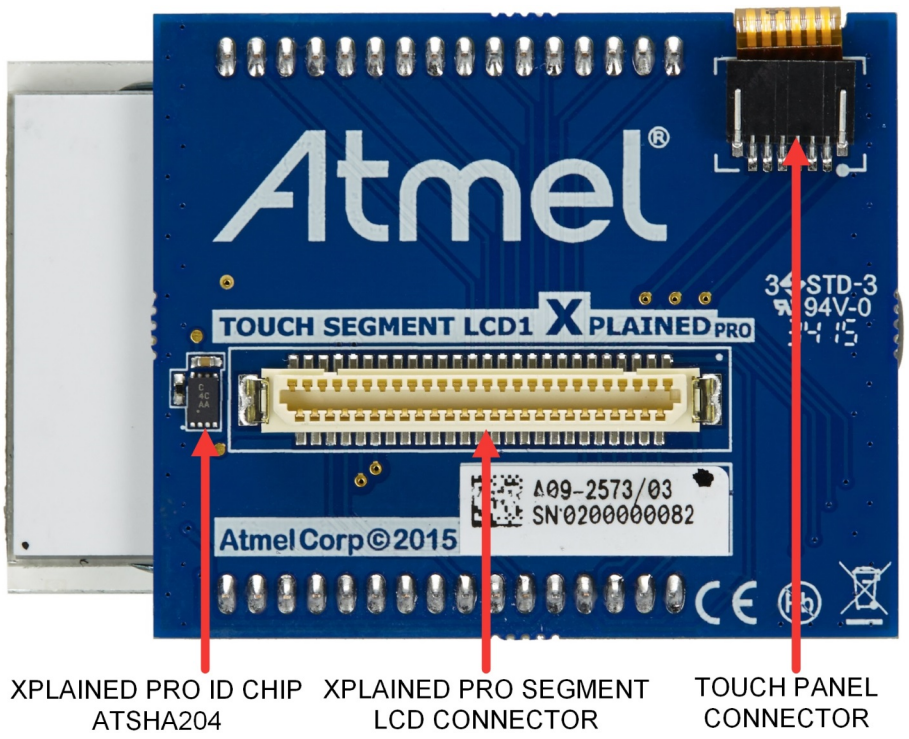


**Figure 1-2 Touch SLCD1 Xplained Pro Bottom Overview**



# 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 Touch SLCD1 Xplained Pro to an Xplained Pro MCU board and connect a USB cable to the DEBUG USB port on the Xplained Pro MCU board.

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 target 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 the Touch SLCD1 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 QTouch® Library PTC** - QTouch Library for Atmel AVR® and ARM®-based microcontrollers.
- **Atmel QTouch® Composer** - Tool for developing capacitive buttons, sliders, and wheels applications.
- **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.
- **Touch SLCD1 Xplained Pro on Atmel web page** - Atmel website 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. 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 3-1 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 |

## 3.2. Xplained Pro Headers and Connectors

### 3.2.1. Xplained Pro Segment LCD Connector

Xplained Pro MCU boards that have a microcontroller, which supports segment LCDs, can implement a 51-pin segment LCD extension connector. This connector is implemented with HIROSE DF-9 series. Xplained Pro MCU boards use the male version DF9-51P-1V(69) and Xplained Pro extension boards use the female counterpart DF9-51S-1V(69). The connector has a standardized pin-out as shown in the table below.

**Info:**
All pins are not connected on all Xplained Pro MCU boards, it depends on how many segments and common terminals the target MCU supports.

Pin 37, 38, 39, 40, 41, and 42 can alternatively be used for QTouch signals. When they are used for touch they should not be used for display segments.

**Table 3-2 Xplained Pro Segment LCD Connector**

| Description | Function | Pin | Pin | Function | Description |
|---|---|---|---|---|---|
| Common terminal 3 | COM3 | 1 | 2 | COM2 | Common terminal 2 |
| Common terminal 1 | COM1 | 3 | 4 | COM0 | Common terminal 0 |
| Segment 0 | SEG0 | 5 | 6 | SEG1 | Segment 1 |
| Segment 2 | SEG2 | 7 | 8 | SEG3 | Segment 3 |
| Segment 4 | SEG4 | 9 | 10 | SEG5 | Segment 5 |
| Segment 6 | SEG6 | 11 | 12 | SEG7 | Segment 7 |
| Segment 8 | SEG8 | 13 | 14 | SEG9 | Segment 9 |
| Segment 10 | SEG10 | 15 | 16 | SEG11 | Segment 11 |
| Segment 12 | SEG12 | 17 | 18 | SEG13 | Segment 13 |
| Segment 14 | SEG14 | 19 | 20 | SEG15 | Segment 15 |
| Segment 16 | SEG16 | 21 | 22 | SEG17 | Segment 17 |
| Segment 18 | SEG18 | 23 | 24 | SEG19 | Segment 19 |
| Segment 20 | SEG20 | 25 | 26 | SEG21 | Segment 21 |
| Segment 22 | SEG22 | 27 | 28 | SEG23 | Segment 23 |
| Segment 24 | SEG24 | 29 | 30 | SEG25 | Segment 25 |
| Segment 26 | SEG26 | 31 | 32 | SEG27 | Segment 27 |
| Segment 28 | SEG28 | 33 | 34 | SEG29 | Segment 29 |
| Segment 30 | SEG30 | 35 | 36 | SEG31 | Segment 31 |
| Segment 32 / QTouch X-line 2 | SEG32 / QT_X2 | 37 | 38 | SEG33 / QT_Y2 | Segment 33 / QTouch Y-line 2 |
| Segment 34 / QTouch X-line 1 | SEG34 / QT_X1 | 39 | 40 | SEG35 / QT_Y1 | Segment 35 / QTouch Y-line 1 |
| Segment 36 / QTouch X-line 0 | SEG36 / QT_X0 | 41 | 42 | SEG37 / QT_Y0 | Segment 37 / QTouch Y-line 0 |
| Common terminal 4 | COM4 | 43 | 44 | COM5 | Common terminal 5 |
| Common terminal 6 | COM6 | 45 | 46 | COM7 | Common terminal 6 |
| Backlight anode | Backlight V+ | 47 | 48 | Backlight V- | Backlight cathode |

| Description | Function | Pin | Pin | Function | Description |
|---|---|---|---|---|---|
| Backlight control | Backlight CTRL | 49 | 50 | ID | Xplained Pro ID |
| Ground | GND | 51 | | | |

# 4. Hardware User Guide

## 4.1. Electrical Characteristics

Touch SLCD1 Xplained Pro can be connected to several Xplained Pro MCU boards and manually connected to other hardware. Xplained Pro MCU board(s) that does not have 3.3V as it's primary target voltage will read all ID devices on connected extensions to check if they support the target voltage before enabling it to the extension headers. The table below shows the static content written in the ID chip.

**Table 4-1 Touch SLCD1 Xplained Pro ID Chip Content**

| Data field | Content |
|---|---|
| Product name | TSLCD1 Xplained Pro |
| Minimum operation voltage | 0V |
| Maximum operation voltage | 3.6V |
| Maximum current | 1mA |

**Related Links**

Hardware Identification System on page 6

## 4.2. Headers and Connectors

### 4.2.1. Touch SLCD1 Xplained Pro Extension Connector

Touch SLCD1 Xplained Pro implements one Xplained Pro segment LCD connector which makes it possible to connect the board to any Xplained Pro MCU board with segment LCD support.Touch SLCD1 Xplained Pro requires eight common terminals and segment terminals 0 through 23 to control all segments. The complete pin-mapping for the connector is described in the table below.

**Table 4-2 Xplained Pro Segment LCD Connector**

| Description | Function | Pin | Pin | Function | Description |
|---|---|---|---|---|---|
| Common terminal 3 | COM3 | 1 | 2 | COM2 | Common terminal 2 |
| Common terminal 1 | COM1 | 3 | 4 | COM0 | Common terminal 0 |
| Segment 0 | SEG0 | 5 | 6 | SEG1 | Segment 1 |
| Segment 2 | SEG2 | 7 | 8 | SEG3 | Segment 3 |
| Segment 4 | SEG4 | 9 | 10 | SEG5 | Segment 5 |
| Segment 6 | SEG6 | 11 | 12 | SEG7 | Segment 7 |
| Segment 8 | SEG8 | 13 | 14 | SEG9 | Segment 9 |
| Segment 10 | SEG10 | 15 | 16 | SEG11 | Segment 11 |
| Segment 12 | SEG12 | 17 | 18 | SEG13 | Segment 13 |
| Segment 14 | SEG14 | 19 | 20 | SEG15 | Segment 15 |
| Segment 16 | SEG16 | 21 | 22 | SEG17 | Segment 17 |

| Description | Function | Pin | Pin | Function | Description |
|---|---|---|---|---|---|
| Segment 18 | SEG18 | 23 | 24 | SEG19 | Segment 19 |
| Segment 20 | SEG20 | 25 | 26 | SEG21 | Segment 21 |
| Segment 22 | SEG22 | 27 | 28 | SEG23 | Segment 23 |
| | NC | 29 | 30 | NC | |
| | NC | 31 | 32 | NC | |
| | NC | 33 | 34 | NC | |
| | NC | 35 | 36 | NC | |
| QTouch X-line 2 | QT_X2 | 37 | 38 | NC | |
| QTouch X-line 1 | QT_X1 | 39 | 40 | QT_Y1 | QTouch Y-line 1 |
| QTouch X-line 0 | QT_X0 | 41 | 42 | QT_Y0 | QTouch Y-line 0 |
| Common terminal 4 | COM4 | 43 | 44 | COM5 | Common terminal 5 |
| Common terminal 6 | COM6 | 45 | 46 | COM7 | Common terminal 6 |
| | NC | 47 | 48 | NC | |
| | NC | 49 | 50 | ID | Xplained Pro ID |
| Ground | GND | 51 | | | |

**Related Links**

Xplained Pro Segment LCD Connector on page 6

## 4.3. Touch Segment LCD Display

Touch SLCD1 Xplained Pro features an LCD module with 8 common and 24 segment terminals. These 179 segments form eight 14-segment characters, five and a half 7-segment characters with delimiters, and some icons. The LCD module runs at 1/8 duty cycle and 1/4 bias. Five mutual capacitance buttons are available on-glass as a separate glass overlay on top of the segment display. These touch buttons are intended to be used with the Peripheral Touch Controller (PTC) available in Atmel microcontrollers.

### 4.3.1. Segments

The figure and table below shows the relation between the common terminals, segment terminals, and the segments on the display.

**Figure 4-1 YMCC8263AAAYDCNC Segments**

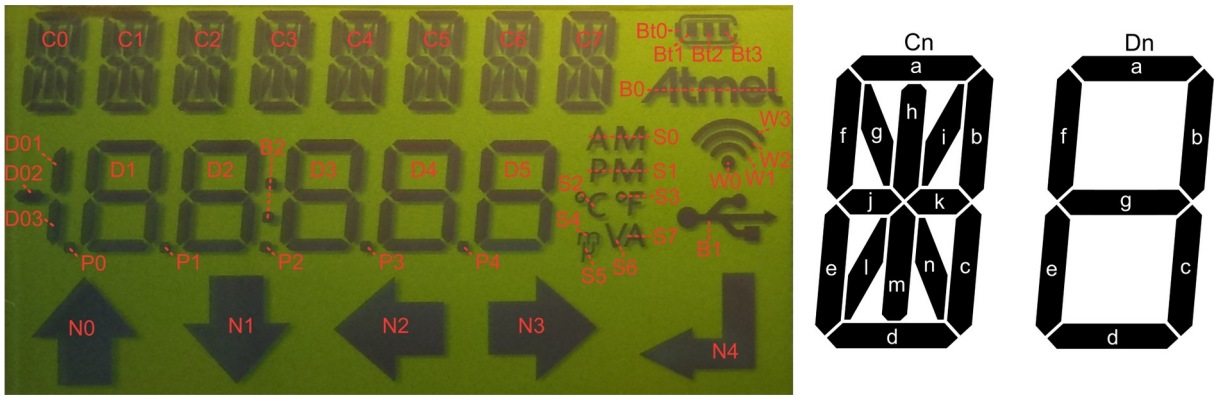



**Table 4-3 YMCC42412AAAFDCL Segments**

| | COM0 | COM1 | COM2 | COM3 | COM4 | COM5 | COM6 | COM7 | Comments |
|---|---|---|---|---|---|---|---|---|---|
| SEG0 | B2 | B0 | B1 | N0 | N1 | N2 | N3 | N4 | Colon, Atmel logo, USB, and arrow indicators. |
| SEG1 | D1a | D1f | D1b | D1g | D1e | D1c | D1d | P0 | 1st 7-segment character and 1st dot-point. |
| SEG2 | W0 | W2 | | | Bt0 | Bt2 | | | 4 stage wireless- and battery indicator. |
| SEG3 | W1 | W3 | | | Bt1 | Bt3 | | | |
| SEG4 | D2a | D2f | D2b | D2g | D2e | D2c | D2d | P1 | 2nd 7-segment character and 2nd dot-point. |
| SEG5 | D3a | D3f | D3b | D3g | D3e | D3c | D3d | P2 | 3rd 7-segment character and 3rd dot-point. |
| SEG6 | D4a | D4f | D4b | D4g | D4e | D4c | D4d | P3 | 4th 7-segment character and 4th dot-point. |
| SEG7 | D5a | D5f | D5b | D5g | D5e | D5c | D5d | P4 | 5th 7-segment character and 5th dot-point. |
| SEG8 | | C0d | C0e | C0l | C0j | C0h | C0g | C0f | 1st 14-segment character |
| SEG9 | | C0c | C0n | C0m | C0k | C0i | C0b | C0a | |
| SEG10 | | C1d | C1e | C1l | C1j | C1h | C1g | C1f | 2nd 14-segment character |
| SEG11 | | C1c | C1n | C1m | C1k | C1i | C1b | C1a | |
| SEG12 | | C2d | C2e | C2l | C2j | C2h | C2g | C2f | 3rd 14-segment character |
| SEG13 | S5 | C2c | C2n | C2m | C2k | C2i | C2b | C2a | 3rd 14-segment character and micro indicator |
| SEG14 | S4 | C3d | C3e | C3l | C3j | C3h | C3g | C3f | 4th 14-segment character and milli indicator. |
| SEG15 | S6 | C3c | C3n | C3m | C3k | C3i | C3b | C3a | 4th 14-segment character and Volt indicator. |

| | COM0 | COM1 | COM2 | COM3 | COM4 | COM5 | COM6 | COM7 | Comments |
|---|---|---|---|---|---|---|---|---|---|
| SEG16 | D01 | C4d | C4e | C4l | C4j | C4h | C4g | C4f | 5th 14-segment character and upper part of half segment. |
| SEG17 | D02 | C4c | C4n | C4m | C4k | C4i | C4b | C4a | 5th 14-segment character and minus indicator. |
| SEG18 | D03 | C5d | C5e | C5l | C5j | C5h | C5g | C5f | 6th 14-segment character and lower part of half segment. |
| SEG19 | S2 | C5c | C5n | C5m | C5k | C5i | C5b | C5a | 6th 14-segment character and Celsius indicator. |
| SEG20 | S1 | C6d | C6e | C6l | C6j | C6h | C6g | C6f | 7th 14-segment character and PM indicator. |
| SEG21 | S0 | C6c | C6n | C6m | C6k | C6i | C6b | C6a | 7th 14-segment character and AM indicator. |
| SEG22 | S3 | C7d | C7e | C7l | C7j | C7h | C7g | C7f | 8th 14-segment character and Fahrenheit indicator. |
| SEG23 | S7 | C7c | C7n | C7m | C7k | C7i | C7b | C7a | 8th 14-segment character and Ampere indicator. |

### 4.3.2. Touch Buttons

The display contains a touch overlay containing five mutual capacitance touch buttons placed above the five arrows on the segment LCD. These touch buttons are intended to be used with the Peripheral Touch Controller (PTC) of supported Atmel devices. The table below show the connections for the touch overlay.

**Table 4-4 Touch Buttons**

| Button | X-line | Y-line | Comments |
|---|---|---|---|
| N0 | X0 | Y0 | Up arrow |
| N1 | X1 | Y0 | Down arrow |
| N2 | X1 | Y1 | Left arrow |
| N3 | X0 | Y1 | Right arrow |
| N4 | X2 | Y1 | Return arrow |

# 5. Revision History and Known Issues

## 5.1. 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 Touch SLCD1 Xplained Pro is A09-2573.

## 5.2. Revision 3

Revision 3 is the initially released revision.

Revision 3 of Touch SLCD1 Xplained Pro is bundled and shipped together with SAM L22 Xplained Pro (ATSAML22-XPRO-B).

# 6. Document Revision History

| Doc. rev. | Date | Comment |
|---|---|---|
| 42558A | 12/2015 | Initial document release. |

# 7. 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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