SMART ARM-based Microcontrollers
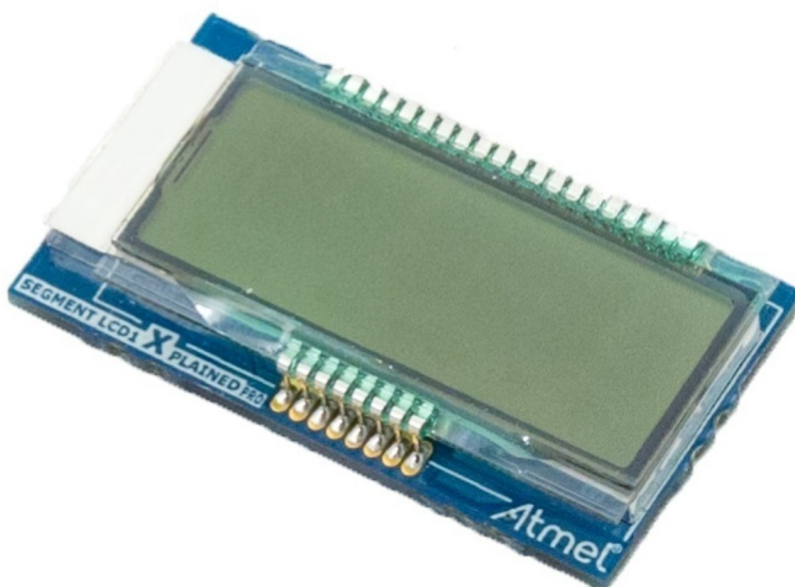
Segment LCD1 Xplained Pro

USER GUIDE

Preface

Atmel® Segment LCD1 Xplained Pro is an extension board to the Atmel Xplained Pro evaluation platform. Segment LCD1 Xplained Pro is designed to kick-start segment LCD development with Atmel microcontrollers that supports segment LCDs.

Table of Contents

1.   Introduction

1.1.   Features

- Custom Segment LCD with 96 individually controllable segments
    - Five 14-segment alphanumeric characters with delimiters
    - Four stage wireless signal indicator
    - Three stage battery indicator
    - AM, PM, Celsius, Fahrenheit, V, mV, USB, play, and Atmel logo indicators.
    - Yellow-green backlight
- Xplained Pro hardware identification system

1.2.   Kit Overview

Atmel Segment LCD1 Xplained Pro extension board is a small circuit board, with a custom back lit segment LCD display, that is compatible with Xplained Pro MCU boards with a segment LCD connector.

Figure 1-1.   Segment LCD1 Xplained Pro Top Overview
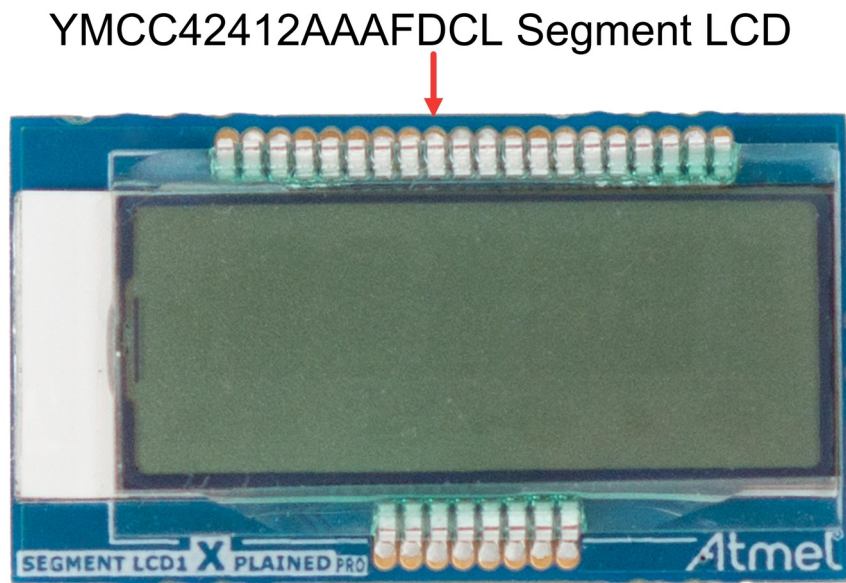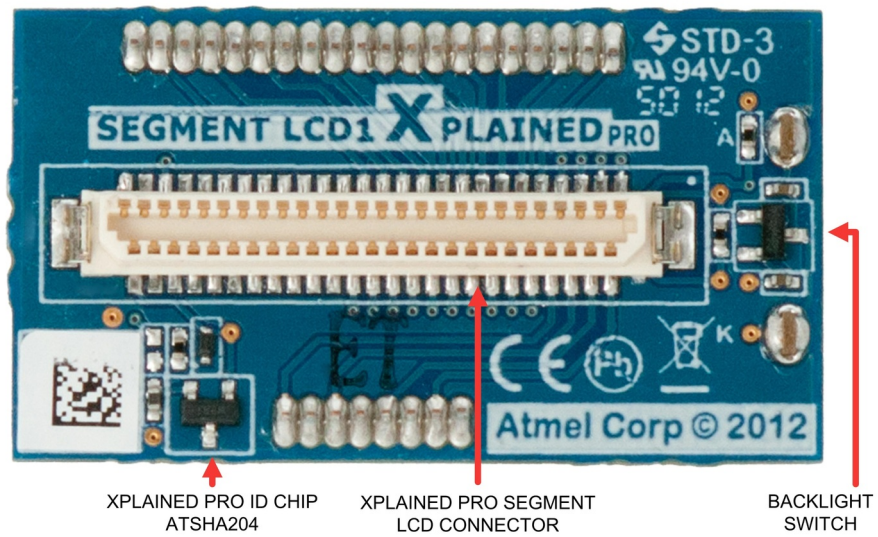

YMCC42412AAAFDCL Segment LCD

Figure 1-2. Segment LCD1 Xplained Pro Bottom Overview

XPLAINED PRO ID CHIP   XPLAINED PRO SEGMENT   BACKLIGHT
ATSHA204   LCD CONNECTOR   SWITCH

2. Getting started

2.1. Xplained Pro Quick Start

Steps to start exploring the Atmel Xplained Pro platform:

1. Download Atmel Studio.
2. Launch Atmel Studio.
3. Connect 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, Windows 8, Windows 10, and Windows Server 2012.

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 SLCD1 Xplained Pro:

- **Xplained products** - Atmel Xplained evaluation kits are a series of easy-to-use evaluation kits for Atmel microcontrollers and other Atmel products. For low pin-count devices the Xplained Nano series provides a minimalistic solution with access to all I/O pins of the target microcontroller. Xplained Mini kits are for medium pin-count devices and adds Arduino Uno compatible header footprint and a prototyping area. Xplained Pro kits are for medium to high pin-count devices, they features advanced debugging and standardized extensions for peripheral functions. All these kits have on board programmers/debuggers which creates a set of low-cost boards for evaluation and demonstration of features and capabilities of different Atmel products.
- **Atmel Studio** - Free Atmel IDE for development of C/C++ and assembler code for Atmel microcontrollers.
- **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.
- **Hardware Users Guide in PDF format** - PDF version of this User Guide.
- **Design Documentation** - Package containing CAD source, schematics, BOM, assembly drawings, 3D plots, layer plots etc.
- **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

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 its 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. SLCD1 Xplained Pro ID Chip Content

Data field	Content
Product name	SLCD1 Xplained Pro
Minimum operation voltage	3.0V
Maximum operation voltage	3.6V
Maximum current	40mA

Related Links

Hardware Identification System on page 6

4.2. Headers and Connectors

4.2.1. Segment LCD1 Xplained Pro Extension Connector

Segment LCD1 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. Segment LCD1 Xplained Pro requires four common terminals and segment terminal 0 through 23 to control all segments. The complete pin-mapping for the connector is described in the table below.

Table 4-2. Segment LCD1 Xplained Pro Extension 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	
	NC	37	38	NC	
	NC	39	40	NC	
	NC	41	42	NC	
	NC	43	44	NC	
	NC	45	46	NC	
Backlight Anode	Backlight V+	47	48	Backlight V-	Backlight Cathode
Backlight Control	Backlight CTRL	49	50	ID	Xplained Pro ID line
Ground	GND	51			

Related Links

Xplained Pro Segment LCD Connector on page 6

4.3. Segment LCD Display

Segment LCD1 Xplained Pro features an LCD module with four common and 24 segment terminals. These 96 segments form several symbols and five 14-segment characters. The LCD module runs at 1/4 duty cycle and 1/3 bias and has yellow-green backlighting.

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. YMCC42412AAAFDCL Segments
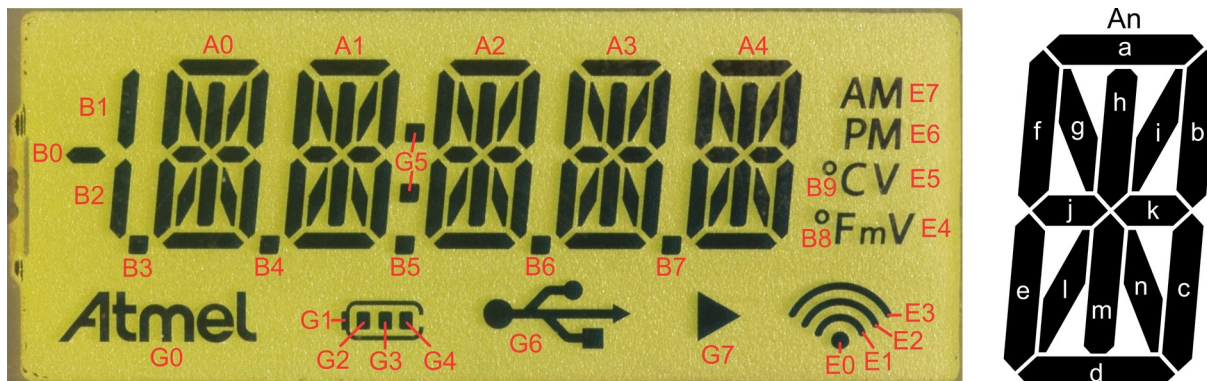
Table 4-3. YMCC42412AAAFDCL Segments

	COM0	COM1	COM2	COM3	Comments
SEG0	G1	G2	G4	G3	Atmel logo, four stage battery-, Dot-point-, usb-, and play indicator
SEG1	G0	G6	G7	G5	
SEG2	E7	E5	E3	E1	Four stage wireless-, AM-, PM-, Volt-, and milli-volt indicator
SEG3	E6	E4	E2	E0	
SEG4	A0-h	A0-i	A0-k	A0-n	1st 14-segment character
SEG5	B3	A0-f	A0-e	A0-d	
SEG6	A0-a	A0-b	A0-c	B4	
SEG7	A0-g	A0-j	A0-l	A0-m	
SEG8	A1-h	A1-i	A1-k	A1-n	2nd 14-segment character
SEG9	B2	A1-f	A1-e	A1-d	
SEG10	A1-a	A1-b	A1-c	B5	
SEG11	A1-g	A1-j	A1-l	A1-m	
SEG12	A2-h	A2-i	A2-k	A2-n	3rd 14-segment character
SEG13	B1	A2-f	A2-e	A2-d	
SEG14	A2-a	A2-b	A2-c	B6	
SEG15	A2-g	A2-j	A2-l	A2-m	
SEG16	A3-h	A3-i	A3-k	A3-n	4th 14-segment character
SEG17	B0	A3-f	A3-e	A3-d	
SEG18	A3-a	A3-b	A3-c	B7	
SEG19	A3-g	A3-j	A3-l	A3-m	
SEG20	A4-h	A4-i	A4-k	A4-n	5th 14-segment character. Celsius and Fahrenheit indicator.
SEG21	B8	A4-f	A4-e	A4-d	
SEG22	A4-a	A4-b	A4-c	B9	
SEG23	A4-g	A4-j	A4-l	A4-m	

4.3.2. Backlight

The segment LCD's backlight is disabled by default and can be enabled by driving the BACKLIGHT CTRL pin high. A FET drives the backlight. A PWM signal can be used to control the backlight intensity.

5. Hardware 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 SLCD1 Xplained Pro is A09-1774.

5.2. Revision 2

Revision 2 of Segment LCD1 Xplained Pro is the initial released version. There are no known issues.

6. Document Revision History

Doc. rev.	Date	Comment
42076B	04/2016	Added electrical characteristics
42076A	02/2013	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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