

Preface

Atmel® OLED1 Xplained Pro is an extension board to the Atmel Xplained Pro evaluation platform. The board enables the user to experiment with user interface applications with buttons, LEDs, and a display.

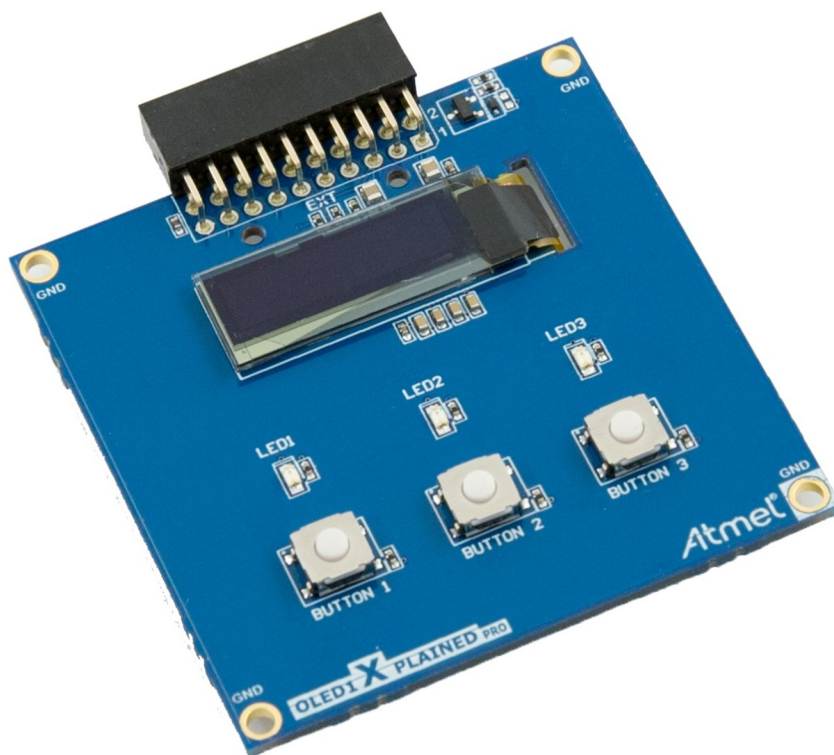


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1. Introduction

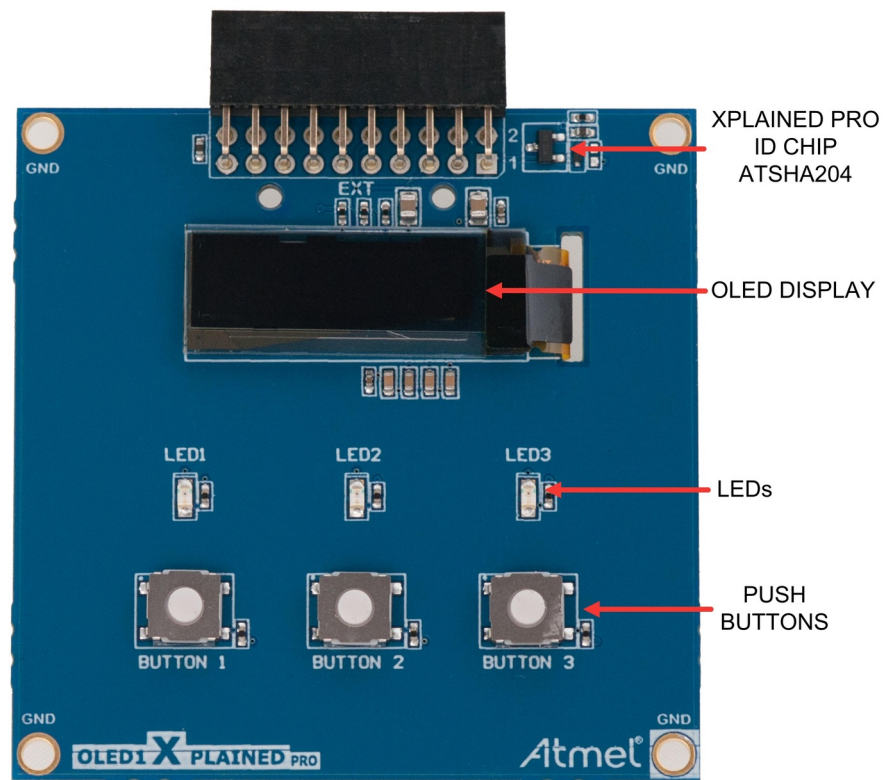
1.1. Features

- UG-2832HSWEG04 monochrome OLED display
 - 128 x 32 Pixels
 - Controlled by 4-wire SPI interface, up to 100MHz
- Three LEDs
- Three Mechanical push buttons
- Xplained Pro hardware identification system

1.2. Kit Overview

OLED1 Xplained Pro is a basic extension board for the Xplained Pro platform with three LEDs, three push buttons, and an OLED display. The OLED display is controlled via a SPI interface up to 100MHz. OLED1 Xplained Pro connects to any Xplained Pro standard extension header on any Xplained Pro MCU board.

Figure 1-1. OLED1 Xplained Pro Top Overview



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 OLED1 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 OLED1 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.
- [OLED1 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 Standard Extension Header

All Xplained Pro kits have one or more dual row, 20-pin, 100mil extension header. Xplained Pro MCU boards have male headers, while Xplained Pro extensions have their female counterparts. Note that all pins are not always connected. All connected pins follow the defined pin-out description in the table below.

The extension headers can be used to connect a variety of Xplained Pro extensions to Xplained Pro MCU boards or to access the pins of the target MCU on Xplained Pro MCU boards directly.

Table 3-2. Xplained Pro Standard Extension Header

Pin number	Name	Description
1	ID	Communication line to the ID chip on an extension board
2	GND	Ground
3	ADC(+)	Analog to digital converter, alternatively positive part of differential ADC
4	ADC(-)	Analog to digital converter, alternatively negative part of differential ADC
5	GPIO1	General purpose I/O
6	GPIO2	General purpose I/O
7	PWM(+)	Pulse width modulation, alternatively positive part of differential PWM
8	PWM(-)	Pulse width modulation, alternatively negative part of differential PWM
9	IRQ/GPIO	Interrupt request line and/or general purpose I/O
10	SPI_SS_B/ GPIO	Slave select for SPI and/or general purpose I/O
11	I ² C_SDA	Data line for I ² C interface. Always implemented, bus type.
12	I ² C_SCL	Clock line for I ² C interface. Always implemented, bus type.
13	UART_RX	Receiver line of target device UART
14	UART_TX	Transmitter line of target device UART
15	SPI_SS_A	Slave select for SPI. Should preferably be unique.
16	SPI_MOSI	Master out slave in line of serial peripheral interface. Always implemented, bus type.
17	SPI_MISO	Master in slave out line of serial peripheral interface. Always implemented, bus type.
18	SPI_SCK	Clock for serial peripheral interface. Always implemented, bus type.
19	GND	Ground
20	VCC	Power for extension board

4. Hardware User Guide

4.1. Electrical Characteristics

OLED1 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. OLED1 Xplained Pro ID Chip Content

Data field	Content
Product name	OLED1 Xplained Pro
Minimum operation voltage	3.0V
Maximum operation voltage	3.6V
Maximum current	10mA

Related Links

[Hardware Identification System](#) on page 5

4.2. Headers and Connectors

4.2.1. OLED1 Xplained Pro Extension Header

OLED1 Xplained Pro implements one Xplained Pro standard extension header marked with EXT in silkscreen. This header makes it possible to connect the board to any Xplained Pro MCU board. The pin-out definition for the extension header can be seen in the table below.

Table 4-2. OLED1 Xplained Pro Extension Header

Pin Number	Function	Description
1	ID	Communication line to ID chip
2	GND	Ground
3	BUTTON2	Push button 2, active low
4	BUTTON3	Push button 3, active low
5	DATA_CMD_SEL	Data / command select for OLED display. High = data, low = command.
6	LED3	LED3, active low
7	LED1	LED1, active low
8	LED2	LED2, active low
9	BUTTON1	Push button 1, active low
10	DISPLAY_RESET	Reset line for OLED display, active low
11	NC	

Pin Number	Function	Description
12	NC	
13	NC	
14	NC	
15	DISPLAY_SS	OLED display slave select, active low
16	SPI MOSI	MOSI signal SPI connected to OLED display
17	NC	
18	SPI SCK	Clock signal for SPI connected to OLED display
19	GND	Ground
20	VCC	Target supply voltage

Related Links

[Xplained Pro Standard Extension Header](#) on page 5

4.3. Peripherals

4.3.1. LEDs

There are three yellow LEDs available on OLED1 Xplained Pro. The LEDs can be activated by driving the connected I/O line low.

Table 4-3. LED Connections

Pin on EXT connector	Silk screen marking
7	LED1
8	LED2
6	LED3

4.3.2. Push Buttons

There are three push buttons available on OLED1 Xplained Pro. When a button is pushed the corresponding I/O pin is connected to ground. There are no external pull-up resistors on OLED1 Xplained Pro, so internal pull-up resistors have to be enabled in the target microcontroller.



Info: Remember to enable internal pull-up resistors in the target device to get a defined electrical level on the I/O lines connected to the buttons.

Table 4-4. Push Buttons Connections

Pin on EXT connector	Silk screen marking
9	BUTTON1
3	BUTTON2
4	BUTTON3

4.3.3. OLED Display

OLED1 Xplained Pro features a 128 x 32 pixel white monochrome OLED display, [UG-2832HSWEG04](#) from WiseChip Semiconductor Inc. The display has a SSD1306 display controller by Solomon Systech built in and is controlled via a 4-wire SPI interface + reset with the signals described in the table below. The datasheets for the display module or the display controller is not publicly available and has to be acquired from the respective manufacturers.

**Info:**

Note that the OLED display does not have a SPI MISO signal. That means that data can only be written to the display, not read.

Table 4-5. OLED Display Connections

Pin on EXT connector	Signal Name	Description
16	SPI_MOSI	SPI master out, slave in signal. Used to write data to the display.
18	SPI_SCK	SPI clock signal, generated by the master.
5	DATA_CMD_SEL	Data/command select. Used to choose whether the communication is data to the display memory or a command to the LCD controller.
15	DISPLAY_SS	SPI slave select signal, must be held low during SPI communication.
10	DISPLAY_RESET	Reset signal to the OLED display, active low. Used during initialization of the display.

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:

```
"nnnnrrssssssss"  
n = product identifier  
r = revision  
s = serial number
```

The product identifier for OLED1 Xplained Pro is A09-1769.

5.2. Revision 3

Revision 3 of OLED1 Xplained Pro is the initial released version.

OLED1 Xplained Pro boards with a serial number that ends with a number lower than 11148 may have a wrong revision programmed into the Xplained Pro ID chip. This will only affect the information displayed by the Atmel Kits extension in Atmel Studio. It will not affect the operation of the board.

6. Document Revision History

Doc. rev.	Date	Comment
42077C	03/2016	Added electrical characteristics
42077B	09/2013	Added errata about revision 3 of the board
42077A	02/2013	First 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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