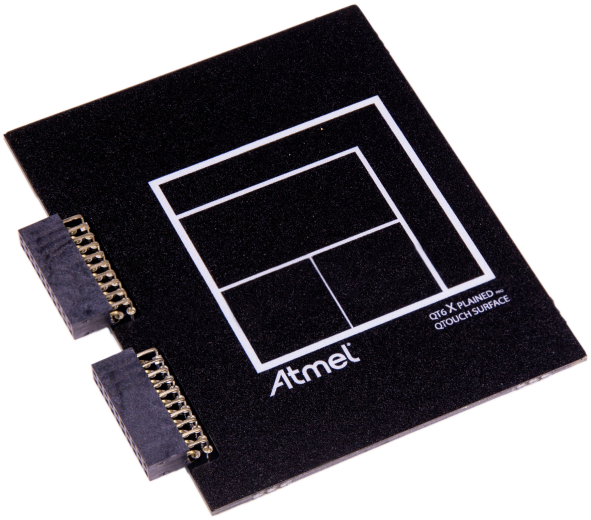
USER GUIDE

Atmel QT6 Xplained Pro



Preface

Atmel® QT6 Xplained Pro kit is a Xplained Pro extension board that enables the evaluation of a mutual capacitance touch suface using the Peripheral Touch Controller (PTC) module. The kit shows how easy it is to design a capacitive touch surface solution for the PTC without the need for any external components. The kit includes one board with a 10 by 10 touch surface.

Table of Contents

Preface 1

1. Introduction 3
   - 1.1. Features 3
   - 1.2. Kit Overview 3

2. Getting Started 4
   - 2.1. Three Steps to Start Exploring the Atmel Xplained Pro Platform 4
   - 2.2. Connecting QT6 Xplained Pro to the Xplained Pro MCU Board 4
   - 2.3. Design Documentation and Related Links 4

3. Xplained Pro 6
   - 3.1. Hardware Identification System 6
   - 3.2. Standard Headers and Connectors 6
     - 3.2.1. Xplained Pro Standard Extension Header 6

4. Hardware User Guide 8
   - 4.1. Headers and Connectors 8
     - 4.1.1. QT6 Xplained Pro Extension Headers 8
     - 4.1.2. Peripherals 9

5. Hardware Revision History and Known Issues 10
   - 5.1. Identifying Product ID and Revision 10
   - 5.2. Revision 4 10

6. Document Revision History 11

7. Evaluation Board/Kit Important Notice 12

1. Introduction

1.1 Features

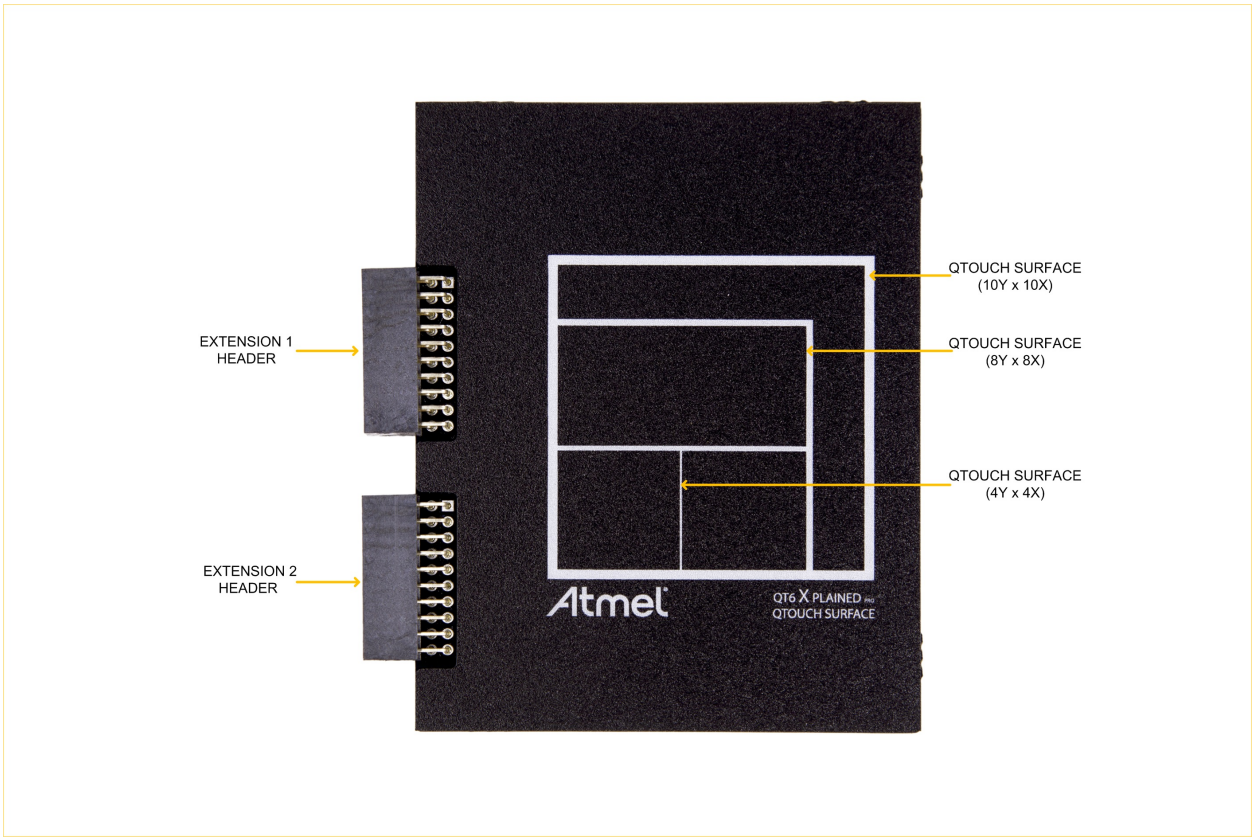
- QTouch®
  - 10x10 Mutual Capacitance matrix
- Xplained Pro hardware identification system

1.2 Kit Overview

Atmel QT6 Xplained Pro extension is designed specifically for Xplained Pro MCU boards featuring a MCU with a built-in peripheral touch controller.

The extension board can be used to explore the touch functions on the PTC module in mutual capacitance mode.

Figure 1-1. QT6 Xplained Pro Extension Board



2. Getting Started

2.1 Three Steps to Start Exploring the Atmel Xplained Pro Platform

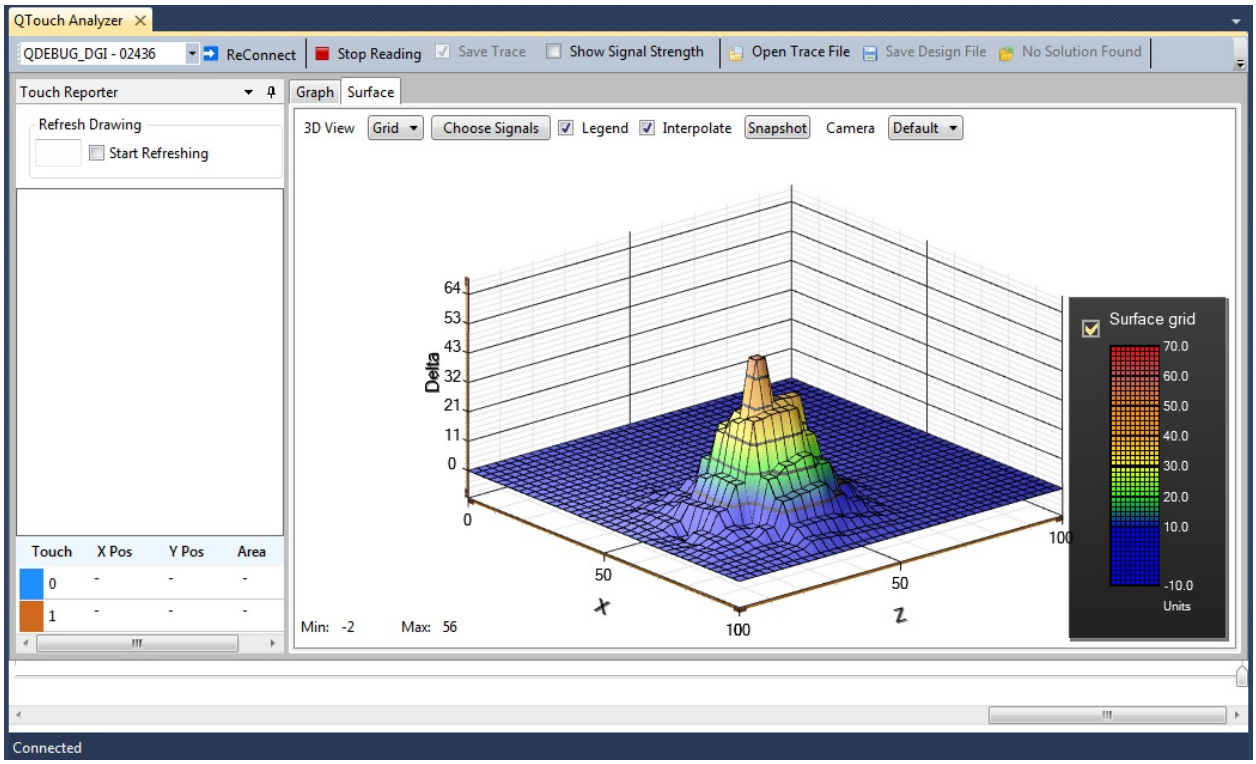
1. Download and install Atmel Studio.
2. Launch Atmel Studio.
3. Connect QT6 Xplained Pro to an Xplained Pro MCU board and connect a USB cable to DEBUG USB port on the Xplained Pro MCU board.

2.2 Connecting QT6 Xplained Pro to the Xplained Pro MCU Board

Atmel QT6 Xplained Pro has been designed to be connected to the header marked EXT1 and EXT2 on the Xplained Pro MCU board.

Development of touch applications will require that you download and install the Atmel QTouch Library and Atmel QTouch Composer from the extension gallery in Atmel Studio.

Figure 2-1. QT6 Xplained Pro in QTouch Analyzer



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) that is connected. Atmel Studio will present relevant information like datasheets and kit documentation. The kit landing page in Atmel Studio also have 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. No external programmer or debugger tool is needed.

2.3 Design Documentation and Related Links

The following list contains links to the most relevant documents and software for QT6 Xplained Pro.

1. **Xplained Pro products** [1] - Atmel Xplained Pro is a series of small-sized and easy-to-use evaluation kits for Atmel AVR® 8- and 32-bit microcontrollers. It consists of a series of low cost MCU boards for evaluation and demonstration of features and capabilities of different MCU families.
2. **QT6 Xplained Pro User Guide** [2] - PDF version of this User Guide.

[1] http://www.atmel.com/XplainedPro
[2] http://www.atmel.com/Images/Atmel-42394-QT6-Xplained-Pro_User-Guide.pdf

3. **QT6 Xplained Pro Design Documentation** [3] - Package containing schematics, BOM, assembly drawings, 3D plots, layer plots etc.
4. **Atmel QTouch Library** [4] - QTouch Library for Atmel AVR and ARM®-based microcontrollers.
5. **Atmel QTouch Composer** [5] - Tool for developing capacitive buttons, sliders and wheels applications.
6. **Atmel Studio** [6] - Free Atmel IDE for development of C/C++ and assembler code for Atmel microcontrollers.

[3] http://www.atmel.com/Images/Atmel-42394-QT6-Xplained-Pro_User-Guide.zip
[4] http://www.atmel.com/tools/QTOUCHLIBRARY.aspx
[5] http://www.atmel.com/tools/atmel_qtouch.aspx
[6] http://www.atmel.com/atmelstudio

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 that 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 that are connected through a set of standardized headers and connectors. Each extension board has an identification (ID) chip to uniquely identify which boards are mounted on a Xplained Pro MCU board. This information is used to present relevant user guides, application notes, datasheets, and example code through Atmel Studio. Available Xplained Pro MCU and extension boards can be purchased in the Atmel Web Store[1].

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 board 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. Table 3-1, “Xplained Pro ID Chip Content” on page 6 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 Standard 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 headers. Xplained Pro MCU boards have male headers while Xplained Pro extensions have their female counterparts. Note that all pins are not always connected. However, all the connected pins follow the defined pin-out described in Table 3-2, “Xplained Pro Extension Header” on page 6. The extension headers can be used to connect a wide variety of Xplained Pro extensions to Xplained Pro MCU boards and to access the pins of the target MCU on Xplained Pro MCU board directly.

Table 3-2. Xplained Pro Extension Header

Pin number	Name	Description
1	ID	Communication line to the ID chip on 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 positive part of differential PWM.

[1] http://store.atmel.com/CBC.aspx?q=c:100113

Pin number	Name	Description
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	TWI_SDA	Data line for two-wire interface. Always implemented, bus type.
12	TWI_SCL	Clock line for two-wire interface. Always implemented, bus type.
13	USART_RX	Receiver line of Universal Synchronous and Asynchronous serial Receiver and Transmitter.
14	USART_TX	Transmitter line of Universal Synchronous and Asynchronous serial Receiver and Transmitter.
15	SPI_SS_A	Slave select for SPI. Should be unique if possible.
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 Headers and Connectors

4.1.1 QT6 Xplained Pro Extension Headers

QT6 Xplained Pro implements two Xplained Pro Standard Extension Header on page 6 marked with EXT1 and EXT2 in silkscreen. These headers make it possible to connect the board to a Xplained Pro MCU board with a MCU featuring a PTC module. The pin-out definition for the extension headers can be seen in Table 4-1, "QT6 Xplained Pro Extension Header 1" on page 8 and Table 4-2, "QT6 Xplained Pro Extension Header 2" on page 8.

Table 4-1. QT6 Xplained Pro Extension Header 1

Pin on EXT	Function	Description
1	ID	Communication line to ID chip.
2	GND	Ground
3	Y1	Y-line 1
4	Y2	Y-line 2
5	Y3	Y-line 3
6	Y4	Y-line 4
7	NC	Not Connected
8	NC	Not Connected
9	Y5	Y-line 5
10	Y6	Y-line 6
11	NC	Not Connected
12	NC	Not Connected
13	NC	Not Connected
14	NC	Not Connected
15	Y7	Y-line 7
16	Y8	Y-line 8
17	Y9	Y-line 9
18	Y10	Y-line 10
19	GND	Ground
20	NC	Not Connected

Table 4-2. QT6 Xplained Pro Extension Header 2

Pin on EXT	Function	Description
1	NC	Not Connected
2	GND	Ground
3	X1	X-line 1
4	X2	X-line 2
5	X3	X-line 3
6	X4	X-line 4
7	X5	X-line 5
8	X6	X-line 6
9	X7	X-line 7
10	X8	X-line 8
11	NC	Not Connected
12	X10	X-line 10

Pin on EXT	Function	Description
13	NC	Not Connected
14	NC	Not Connected
15	X9	X-line 9
16	NC	Not Connected
17	NC	Not Connected
18	NC	Not Connected
19	GND	Ground
20	NC	Not Connected

4.1.2 Peripherals

4.1.2.1 Touch Sensors

QT6 Xplained Pro has 10x10 mutual capacitance touch surface sensor that can be used as touchpad. Alternatively, by configuring the required X-lines and Y-lines touch sensors can be configured to activate 4x4, 4x8, and 8x8 matrix touch pads.

Visual feedback for touch pad can be obtained by connecting the Xplained PRO board to the QTouch Analyzer.

Note This kit is only supported by Xplained Pro MCU boards that have a MCU with a built-in PTC and a matching pin out that connects all sensors of the extension. Currently supported MCU boards are *SAM D20 Xplained Pro* and *SAM D21 Xplained Pro*.

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; through Atmel Studio or by looking at the sticker on the bottom side of the PCB.

By connecting a 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 Kits 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 kit identifier for QT6 Xplained Pro is 2443.

5.2 Revision 4

Revision 4 of QT6 Xplained Pro (2443) is the initial released version, there are no known issues.

6. Document Revision History

Document revision	Date	Comment
42394A	01/2015	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.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER USER NOR ATMEL SHALL BE LIABLE TO EACH OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

No license is granted under any patent right or other intellectual property right of Atmel covering or relating to any machine, process, or combination in which such Atmel products or services might be or are used.





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

© 2015 Atmel Corporation. / Rev.: 42394A-MCU-01/2015

Atmel®, Atmel logo and combinations thereof, Enabling Unlimited Possibilities®, AVR®, QTouch®, and others are registered trademarks or trademarks of Atmel Corporation in U.S. and other countries. ARM® and others are registered trademarks of ARM Ltd. Other terms and product names may be trademarks of others.

DISCLAIMER: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. EXCEPT AS SET FORTH IN THE ATMEL TERMS AND CONDITIONS OF SALES LOCATED ON THE ATMEL WEBSITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS AND PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and products descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

SAFETY-CRITICAL, MILITARY, AND AUTOMOTIVE APPLICATIONS DISCLAIMER: Atmel products are not designed for and will not be used in connection with any applications where the failure of such products would reasonably be expected to result in significant personal injury or death (“Safety-Critical Applications”) without an Atmel officer's specific written consent. Safety-Critical Applications include, without limitation, life support devices and systems, equipment or systems for the operation of nuclear facilities and weapons systems. Atmel products are not designed nor intended for use in military or aerospace applications or environments unless specifically designated by Atmel as military- grade. Atmel products are not designed nor intended for use in automotive applications unless specifically designated by Atmel as automotive-grade.