ATBTLC1000 Xplained Pro

USER GUIDE

Preface

Atmel® ATBTLC1000 Xplained Pro is an extension board to the Atmel Xplained Pro evaluation platform. It is designed to demonstrate ultra-low power Bluetooth® SMART (BLE 4.1) ATBTLC1000 together with Xplained Pro MCU boards.

Table of Contents

1. Introduction

1.1. Features

- ATBTLC1000-MR110CA Bluetooth module
  - Complies with Bluetooth V4.1, ETSI EN 300 328 and EN 300 440 Class 2, FCC CFR47 Part 15, and ARIB STD-T66
  - ARM$^®$ Cortex$^®$-M0 32-bit processor
- AT30TSE758A Digital Temperature Sensor
  - Integrated temperature sensor + nonvolatile registers + serial EEPROM
  - 2-Wire I^{2}C and SMBus compatible serial interface
- Xplained Pro hardware identification system using ATSHA204A
- Power LED
- Power debugger support using current measurement header
- Provision for external flash (footprint only). Recommended MPN: IS25LD020-JNLE.
- Debug I^{2}C header
- Debug UART/SPI extension port
- CHIP EN switch for ATBTLC1000 module (footprint only)
- SWD header
- 32kHz crystal

1.2. Kit Overview

The Atmel ATBTLC1000 Xplained Pro is an extension board containing the Atmel ultra-low power Bluetooth module "ATBTLC1000-MR110CA" for the Xplained Pro platform. The kit can be connected to any extension header on the Xplained Pro MCU Board.

Figure 1-1 ATBTLC1000 Xplained Pro Extension Board
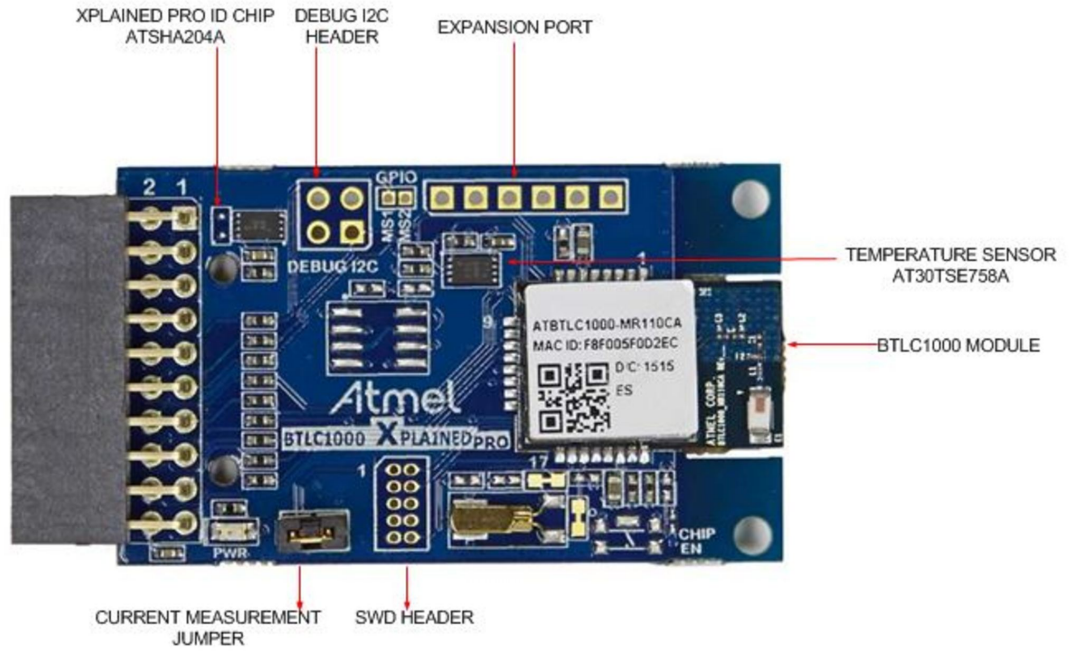
2. Getting Started

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 ATBTLC1000 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 Atmel ATBTLC1000 Xplained Pro 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.

3. Design Documentation and Relevant Links

The following list contains links to the most relevant documents and software for ATBTLC1000 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.
- **EDBG User Guide** - User guide containing more information about the on-board Embedded Debugger.
- **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.
- Atmel Software Framework

4. 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.

4.1. 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. Table 4-1 Xplained Pro ID Chip Content on page 7 shows the data fields stored in the ID chip with example content.

Table 4-1 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

4.2. Xplained Pro Headers and Connectors

4.2.1. 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 Table 4-2 Xplained Pro Standard Extension Header on page 8.

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 4-2 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

5. Hardware Users Guide

5.1. Headers and Connectors

5.1.1. ATBTLC1000 Xplained Pro Extension Headers

ATBTLC1000 Xplained Pro implements one Xplained Pro Standard Extension Header, see Section Xplained Pro Standard Extension Header on page 7, marked with EXT1 in silkscreen. These headers make it possible to connect the board to an Xplained Pro MCU board. The pin-out definition for the extension headers can be seen in Table 5-1 ATBTLC1000 Xplained Pro Extension Header EXT1 on page 9.

Table 5-1 ATBTLC1000 Xplained Pro Extension Header EXT1

Pin on EXT1	Function	Description
1	ID	Communication line to the ID chip
2	GND	Ground
3	NC	Not Connected
4	NC	Not Connected
5	NC	Not Connected
6	GPIO/WAKE	Always-on External Wakeup
7	NC	Not Connected
8	PWM-/RTC_CLKP	32.768kHz RTC Clock (optional feature)
9	GPIO_MS1	Mixed signal/Analog interface pin
10	GPIO/CHIP_EN	Master Enable for chip
11	TWI_SDA	I^{2}C SDA
12	TWI_SCL	I^{2}C SCL
13	UART_TX	UART TX
14	UART_RX	UART RX
15	SPI_SS_A	SPI SS
16	SPI_MOSI	SPI MOSI
17	SPI_MISO	SPI MISO
18	SPI_SCK	SPI Clock
19	GND	Ground
20	VCC	Target supply voltage

5.1.2. Power Measurement Header

Current Measurement header "J101" can be used to measure the current consumed by BTLC1000 module using an ammeter. There are two 0Ω resistors "R112", "R113" that can be used to measure the current consumed by individual power rails "VDDIO" and "VBAT" respectively.

5.1.3. Debug Connectors

"Debug I^{2}C" (J104) and Extension port (J105) are not mounted on the board. Extension port J105 can be configured as Debug UART or as SPI to connect to external sensors. Refer to the ATBTLC1000-MR110CA datasheet for reference.

Table 5-2 Debug I^{2}C Connector

Pin on I^{2}C connector	Pin on BTLC1000 module	Function
1	8	I^{2}C SCL
2	1	Ground
3	7	I^{2}C SDA
4	-	Not Connected

Table 5-3 Extension Port

Pin on Extension Port	Pin on BTLC1000 module	Function
1	4	UART RX/ SPI SCK
2	5	UART TX/SPI MOSI
3	21	DBG_UART_RX/SPI SSN
4	23	DBG_UART_TX/SPI MISO
5	1	Ground
6	1	Ground

5.2. Peripherals

5.2.1. External Flash

ATBTLC1000-XPRO provides footprint of IS25LD020-JNLE, 2Mb external flash (U103). By default the flash is connected to the SPI Master/Slave interface of the ATBTLC1000 module, which is also connected to the Xplained Pro extension header. SPI Flash master interface of the ATBTLC1000 can also be used to control the ATBTLC1000 by reconfiguring the jumper straps (J109-J112) as below.

Jumper Strap Configuration 1 for SPI Master/Slave Peripheral: Short straps J109, J110, J111, J112 ; Open straps J113, J114, J115, J116

Jumper Strap Configuration 2 for SPI Flash Master Peripheral: Short straps J113, J114, J115, J116; Open straps J109, J110, J111, J112

Refer to Design Documentation and ATBTLC1000-MR110CA datasheet for further reference.

Table 5-4 External Flash Pin Configuration

Pin on External Flash	Pin on BTLC1000 Module with Jumper Strap Configuration 1	Pin on BTLC1000 Module with Jumper Strap Configuration 2
1	12	21
2	14	23

Pin on External Flash	Pin on BTLC1000 Module with Jumper Strap Configuration 1	Pin on BTLC1000 Module with Jumper Strap Configuration 2
5	11	5
6	10	4

5.2.2. Power LED

Power LED (D101) is connected to the power rail from the extension header. Current measurement jumper has to be closed to enable power to the ATBTLC1000 module.

5.2.3. Reset Switch

ATBTLC1000-XPRO contains footprint of switch (SW100) along with resistor R111 and capacitor C107 that can be mounted to reset the ATBTLC1000. The switch is connected to the CHIP_EN pin of the ATBTLC1000, which is pulled up by default.

5.2.4. 32kHz RTC Oscillator

The ATBTLC1000 has a 32.768kHz RTC oscillator that is used for BLE activities involving connection events. There is also provision to reconfigure the ATBTLC1000 Xplained Pro board to bypass external crystal oscillator with an external signal capable of driving 2pF on the RTC_CLK_P pin of the ATBTLC1000-MR110CA.

Table 5-5 Configuring the RTC Oscillator

Configuration option	Board configuration
32.768kHz RTC oscillator	Open R105, Close J107
External signal on RTC_CLK_P	Close R105, Open J107, J106

6. Hardware Revision History and Known Issues

6.1. 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 ATBTLC1000 Xplained Pro is A09-2528.

6.2. Revision 2

Revision 2 is the initially released revision, there are no known issues.

7. Document Revision History

Doc. rev.	Date	Comment
42538A	09/2015	Initial document release.

8. 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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