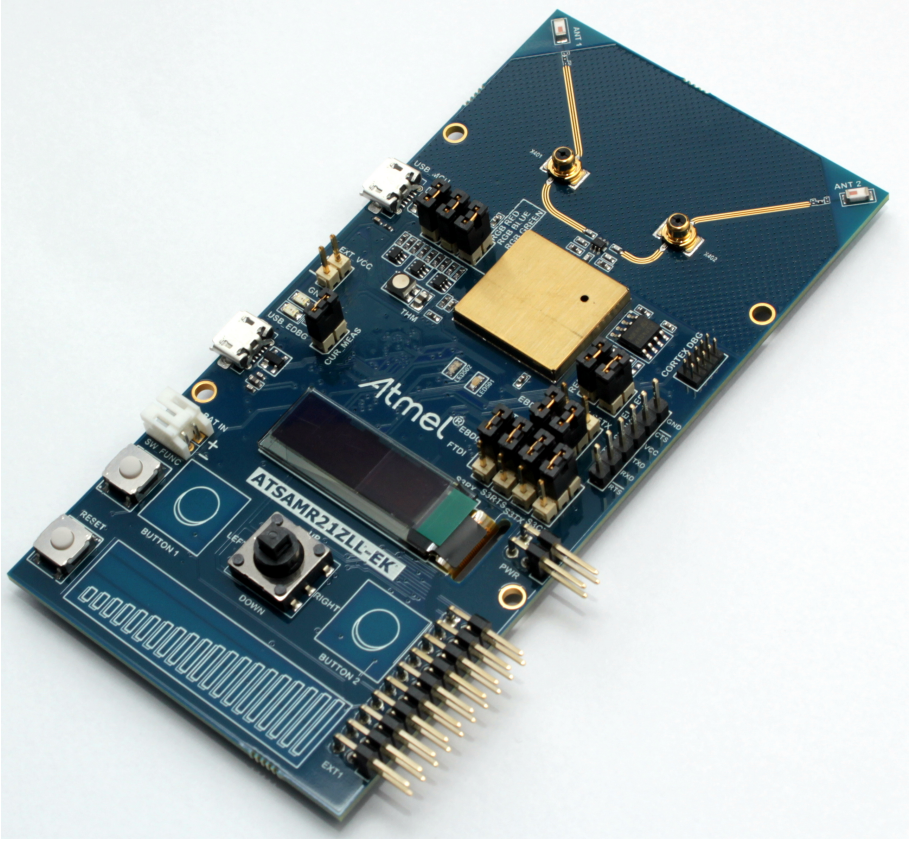
USER GUIDE

Atmel ATSAMR21ZLL-EK



Preface

The Atmel® ATSAMR21ZLL-EK evaluation kit is a hardware platform based on Atmel ATSAMR21G18A microcontroller. The kit is fully integrated with the Atmel Studio development platform, enabling application development with BitCloud® ZigBee® PRO libraries.

The kit supports on-board embedded debugger, antenna diversity, RGB LED, QMatrix™ interface, OLED display, joystick, user LEDs, user switches, Atmel Xplained Pro extension header, external USB, and UART interfaces.

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1. Introduction

1.1 Features

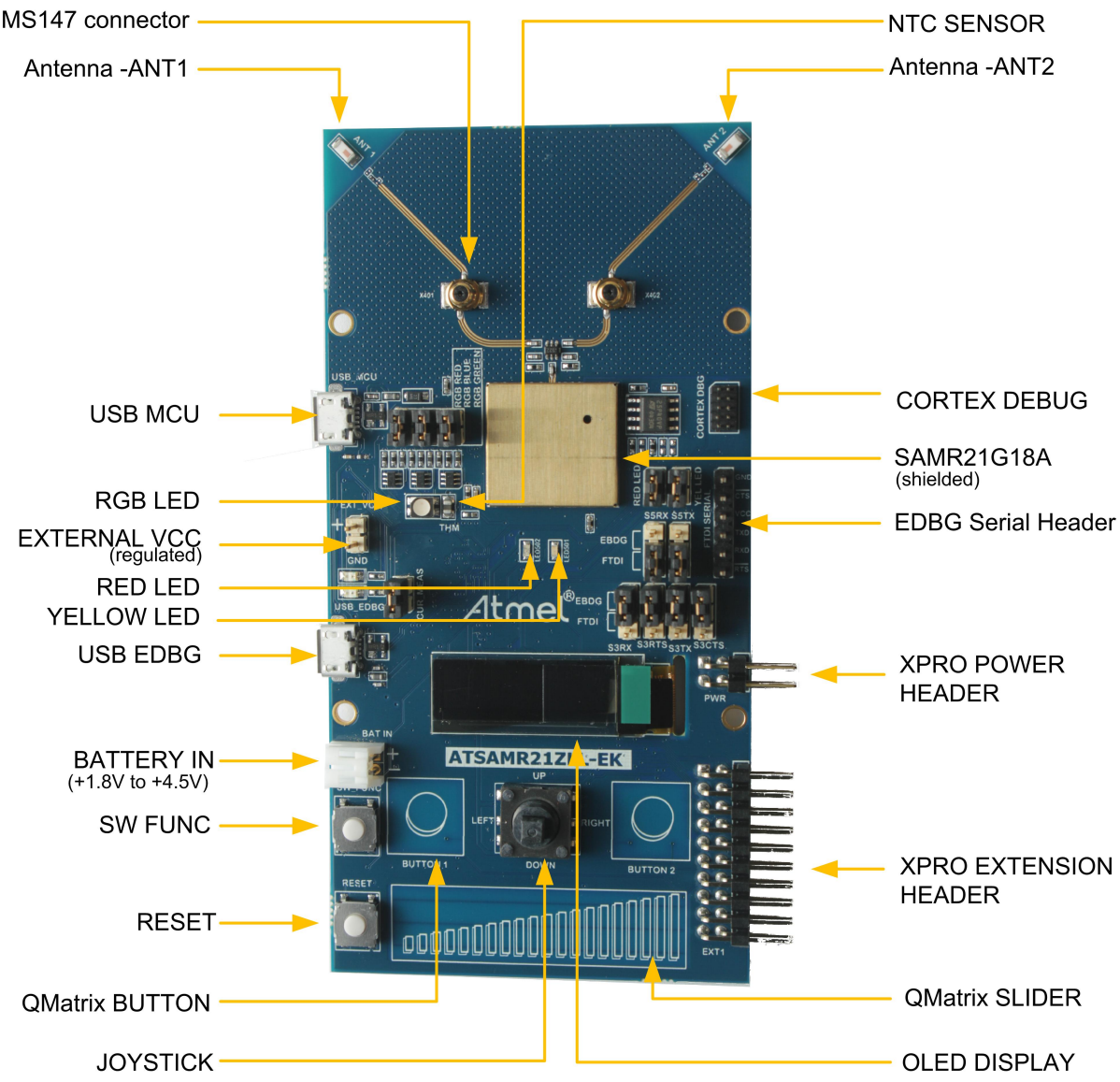
- Atmel ATSAMR21G18A ARM® Cortex®-M0+ based on 32-bit microcontroller with best-in-class 2.4GHz RF transceiver
- Antenna Diversity
  - Two ceramic chip antenna (2540AT18A100)
  - Two MS-147 connector for RF test port
- Touch Interface
  - Two QMatrix™ button
  - One QMatrix™ Slider
- RGB LED
- OLED Display
- Joystick
- Serial Flash
- Temperature sensor
- CryptoAuthentication™
- Serial communication header
- Mechanical button
- EDBG USB and SAM R21 USB
- 64bit MACID stored in SAM R21 NVM
- Embedded debugger (EDBG)
  - USB interface
  - Programming and debugging on board SAM R21 through Serial Wire Debug (SWD)
  - Virtual COM-port interface to target via UART
- Digital I/O
  - Two mechanical buttons (user and reset button)
  - Two user LED
  - One extension header
- Four possible power sources
  - External power
  - Embedded debugger USB
  - Target USB
  - Battery Power
- 32kHz crystal

- 16MHz crystal
- USB interface, device

1.2 Kit Overview

ATSAMR21ZLL-EK evaluation kit is a hardware platform based on Atmel ATSAMR21G18A microcontroller featuring wireless, QMatrix™ , RGB LED, external flash, display, etc. With onboard debugger, the kit is fully integrated with the Atmel Studio development platform, enabling application development with BitCloud ZigBee PRO libraries.

Figure 1-1. ATSAMR21ZLL-EK Evaluation Kit Overview



2. Getting Started

2.1 Quick-start

Three steps to start exploring the Atmel Xplained Pro Platform

- Download and install **Atmel Studio**[1]
- Launch Atmel Studio
- Connect a Micro-B cable to the DEBUG USB port

2.2 Connecting the Kit

When connecting Atmel ATSAMR21ZLL-EK to your computer for the first time, the operating system will do a driver software installation. The driver file supports both 32-bit and 64-bit versions of Microsoft® Windows® XP and Windows 7.

Once connected the green power LED will be lit and Atmel Studio will autodetect which Xplained Pro evaluation- and extension kit(s) that's connected. You'll be presented with relevant information like datasheets and kit documentation. You also have the option to launch Atmel Software Framework (ASF) example applications. The target device is programmed and debugged by the on-board Embedded Debugger and no external programmer or debugger tool is needed. Refer to the Atmel Studio user guide[2] for information regarding how to compile and program the kit.

2.3 Design Documentation and Related Links

The following list contains links to the most relevant documents and software for ATSAMR21ZLL-EK.

1. **Xplained Pro products** [3] - 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. **ATSAMR21ZLL-EK User Guide** [4] - PDF version of this User Guide.
3. **ATSAMR21ZLL-EK Design Documentation** [5] - Package containing schematics, BOM, assembly drawings, 3D plots, layer plots etc.
4. **EDBG User Guide** [6] - User guide containing more information about the onboard Embedded Debugger.
5. **Atmel Studio** [7] - Free Atmel IDE for development of C/C++ and assembler code for Atmel microcontrollers.
6. **IAR Embedded Workbench®** [8] for **ARM®**. This is a commercial C/C++ compiler that is available for ARM. There is a 30 day evaluation version as well as a code size limited kick-start version available from their website. The code size limit is 16KB for devices with M0, M0+, and M1 cores and 32kB for devices with other cores.
7. **Atmel sample store** [9] - Atmel sample store where you can order samples of devices.

[1] http://www.atmel.com/atmelstudio
[2] http://www.atmel.com/atmelstudio
[3] http://www.atmel.com/XplainedPro
[4] http://www.atmel.com/Images/Atmel-42462-ATSAMR21ZLL-EK_User-Guide.pdf
[5] http://www.atmel.com/Images/Atmel-42462-ATSAMR21ZLL-EK_User-Guide.zip
[6] http://www.atmel.com/Images/Atmel-42096-Microcontrollers-Embedded-Debugger_User-Guide.pdf
[7] http://www.atmel.com/atmelstudio
[8] http://www.iar.com/en/Products/IAR-Embedded-Workbench/ARM/
[9] http://www.atmel.com/system/samplesstore

3. Hardware User Guide

3.1 Power Supply

The ATSAMR21ZLL-EK kit supports powering through EDBG USB, MCU USB, BATTERY header, and External VCC header. The hardware has a safety features that supports connecting USB and BATTERY supply simultaneously.

External regulated DC voltage can be supplied at "external vcc" header (EXT_VCC silkscreen text) when other supplies are NOT present. EXT_VCC could be used for testing the low voltage operation of SAM R21. External VCC header should be OPEN in all other powering modes.

XPRO Power header (Silk text PWR) has regulated 3.3V and unregulated 5V supply outputs available at the header pins. When no other supply is connected, it is possible to power the board by a 5V DC supplied at the 5V pin of PWR header. Pin mapping for PWR header is decribed in Table 3-3, “Power Header PWR” on page 7.

Table 3-1. Power Sources for ATSAMR21ZLL-EK

Power input	Voltage requirements	Current requirements	Connector marking
Embedded debugger USB	4.4V to 5.25V (according to USB spec)	500mA (according to USB spec)	USB EDBG
Target USB	4.4V to 5.25V (according to USB spec)	500mA (according to USB spec)	USB MCU
External battery	1.8V to 4.5V	Depending on peripheral usage	BAT IN
External supply	1.62V to 3.63V(device specification)	Depending on peripheral usage	EXT VCC

3.1.1 Measuring SAM R21 Power Consumption

MCU current measurements can be performed by connecting multimeter (current mode) across current measurement jumper J201 ("CUR MEAS" silkscreen text). The SAM R21 power supply is isolated from the rest of the circuitry, but is connected through peripheral interfaces. Current measurement jumper should be closed in other operating modes.

3.2 Connectors

This chapter describes the implementation of the relevant connectors and headers on ATSAMR21ZLL-EK and their connection to the ATSAMR21G18A. The tables of connections in this chapter also describes which signals are shared between the headers and on-board functionality.

3.2.1 I/O Extension Headers

The ATSAMR21ZLL-EK header EXT1 offer access to the I/O of the microcontroller in order to expand the board e.g. by connecting extensions to the board. These headers all comply with the standard extension header specified in ATSAMR21-XPRO user guide[1]. All headers have a pitch of 2.54mm. Normally closed jumper straps are given to the shared functionality of signals on EXT1 header. When Xplained Pro extensions are used with ATSAMR21ZLL-EK these straps can be cut open if required.

Table 3-2. Extension Header EXT1

Pin on EXT1	SAM R21 pin	Function	Shared functionality [strap]
1 [ID]	-	Communication line to ID chip on extension board	
2 [GND]	-	GND	
3 [ADC(+)]	PA06	AIN[6]	Joystick [J217]

[1] http://www.atmel.com/Images/Atmel-42243-SAMR21-Xplained-Pro_User-Guide.pdf

Pin on EXT1	SAM R21 pin	Function	Shared functionality [strap]
4 [ADC(-)]	PA07	AIN[7]	Thermistor [J210]
5 [GPIO1]	PA13	GPIO	RF switch [J222]
6 [GPIO2]	PA12	GPIO	RF switch [J223]
7 [PWM(+)]	PA18	TCC0 / WO[2]	Touch, RGB LED
8 [PWM(-)]	PA19	TCC0 / WO[3]	Touch, RED LED
9 [IRQ/GPIO]	PA22	EXTINT[6]	OLED display [J211]
10 [SPI_SS_B/GPIO]	PA23	GPIO	OLED display [J213]
11 [TWI_SDA]	PA16	SERCOM1 PAD[0] I²C SDA	Touch, RGB LED
12 [TWI_SCL]	PA17	SERCOM1 PAD[1] I²C SCL	Touch, RGB LED
13 [USART_RX]	PA04	SERCOM0 PAD[1] UART RX	Touch
14 [USART_TX]	PA05	SERCOM0 PAD[0] UART TX	Touch
15 [SPI_SS_A]	PB03	SERCOM5 PAD[1] SPI SS	Serial, OLED display [J216]
16 [SPI_MOSI]	PB22	SERCOM5 PAD[2] SPI MOSI	OLED display[J214]
17 [SPI_MISO]	PB02	SERCOM5 PAD[0] SPI MISO	Yellow LED, OLED [J215]
18 [SPI_SCK]	PB23	SERCOM5 PAD[3] SPI SCK	CRYPTO [J212]
19 [GND]	-	GND	
20 [VCC]	-	VCC	

Table 3-3. Power Header PWR

Pin on PWR	Pin Name	Function	functionality
1 [NC]	NC	No Connection	
2 [GND]	GND	Board ground	Ground
3 [5VDC]	5VDC	5V DC	5V supply OUT/5V external supply IN
4 [3V3DC]	3V3DC	3.3 DC supply	3.3V supply OUT

3.2.2 Other Headers and Connectors

Serial header on the board provide access to uart port with hardware flow control signal. Cortex debug header support external programming of the SAM R21.

3.2.2.1 Serial Header

The Serial header is marked with "FTDI Serial" in silkscreen of the kit. UART signals with flow control (RX,TX, RTS, CTS) are provided at this header. Signal to this pin are configurable using jumpers available on the board. SERCOM5 or SERCOM3 signals are connected to the serial header according to the jumper connections explained in “Serial (UART) Interface ” on page 12.

Table 3-4. Serial Header - SERCOM5

Pin on header	Pin Name	Pin on SAM R21	Function
1	GND	Ground	Ground Signal for the header
2	CTS	PA24	SERCOM5_PAD[2]
3	VCC	3.3V	3.3V DC supply
4	TXD	PB03	SERCOM5_PAD[0]
5	RXD	PB02	SERCOM5_PAD[1]
6	RTS	PA25	SERCOM5_PAD[3]

Table 3-5. Serial Header - SERCOM3

Pin on header	Pin Name	Pin on SAM R21	Function
1	GND	Ground	Ground Signal for the header

Pin on header	Pin Name	Pin on SAM R21	Function
2	CTS	PA24	SERCOM3_PAD[2]
3	VCC	3.3V	3.3V DC supply
4	TXD	PA28	SERCOM3_PAD[1]
5	RXD	PA27	SERCOM3_PAD[0]
6	RTS	PA25	SERCOM3_PAD[3]

3.2.2.2 Cortex Debug Connector

The Cortex debug connector is provided to enable external debuggers to be connected to the ATSAMR21G18A. The footprint is made for a 2x5 50mil connector and the pinout is shown in Table 3-6, "Cortex Debug Connector" on page 8. These lines are shared with on board EDBG and both interfaces should not be used for SWD at the same time.

Table 3-6. Cortex Debug Connector

Pin on connector	Connected	Function
1	VCC Target	Voltage reference
2	PA31_SWDIO	Debug data
3	GND	GND
4	PA30_SWCLK	Debug clock
5	GND	GND
6	NC	-
7	NC	-
8	NC	-
9	GND	GND detect
10	RESETN	Target reset

3.3 Peripherals

3.3.1 Crystal

The ATSAMR21ZLL-EK kit contains one crystal that can be used as clock source for the SAM R21 device. The crystal has a cut-strap next to it that can be used to measure the oscillator safety factor. This is done by cutting the strap and adding a resistor across the strap. More information about oscillator allowance and safety factor can be found in appnote AVR4100[2].

Note The 16MHz crystal is connected directly to the RF die inside the SAM R21. The clock signal generated by the crystal is routed from the CLKM pin on the RF die to a GCLK I/O pin on the microcontroller. For more information on how the RF die is connected to the microcontroller and how to configure the CLKM pin see the SAM R21 datasheet.

Table 3-7. External 32.768kHz Crystal

Pin on SAM R21	Function
PA00	XIN32
PA01	XOUT32

Table 3-8. External 16MHz Crystal

Pin on SAM R21	Function
XTAL1	XIN
XTAL2	XOUT

[2] http://www.atmel.com/images/doc8333.pdf

3.3.2 RF Interface

ATSAMR21G18A is an IEEE® 802.15.4 compliant single chip that combines an ARM® Cortex®-M0+ based 32-bit microcontroller and best-in-class 2.4GHz RF transceiver. It offers the industry's highest RF performance for single chip devices, with a link budget of 105dBm while consuming 50% less current than the existing offerings.

SAM R21 has bidirectional 100ohm differential antenna pins, which are fed through a balun (Johanson Technology, 2450BM15A0015[3]) to create a single 50ohm unbalanced output/input. This kit has a passive analog RF switch (Skyworks Solutions Inc., AS222-92LF[4]) connected to the unbalanced output of the balun. The switch is driven by the DIG1 and DIG2 pins of the ATSAMR21G18A which feature Antenna Diversity to enable the device to automatically select the best signal from two antennas (can also be selected manually). The output of the switch is connected to two ceramic chip antennae (Johanson Technology, 2540AT18A100[5]). Antennae are separated by a distance of ~50mm on the PCB and are oriented such that they compliment each other in multipath fading. ATREB231ED radio extender board details the design guidlines for diversity chip antennae design Atmel AVR2043[6].

MS-147[7] RF connector switch is given in each of the antennae path. This RF switches can be used as RF test ports for conductive RF measurements. And also can be used to create direct communication link between two ATSAMR21ZLL-EK when used with SMA cable and RF attenuator.

Table 3-9. RF Connections

Pin on SAM R21	RF
RFP	RF balanced output (positive)
RFN	RF balanced output (negative)
PA12 / FECTRL2	RF switch control signal (negative)
PA13 / FECTRL3	RF switch control signal (positive)

PA12 and PA13 has FECTRL peripheral pins multiplexed. PA12 and PA13 are connected to V1 and V2 control line of AS222-92LF[8] respectively. Table 3-10, “RF Switch Control” on page 9 explains the antenna selection beased on V1 and V2 input.

Table 3-10. RF Switch Control

V1 (PA12)	V2 (PA13)	Switch connection	Antenna [silk text]
HIGH	0	J1-J3	A402 [ANT2]
0	HIGH	J1-J2	A401 [ANT1]

3.3.3 Touch Interface

The ATSAMR21ZLL-EK has two buttons and one slider. Button and slider are interfaced to the PTC module of SAM R21 in Qmatrix configuration. Since the PTC pins are multiplexed with RGB LED and (user) LED_RED, remove the respective jumpers for using the functionality. More information on Touch Design can be found in appnote QTAN0079[9].

Table 3-11, “QMatrix Jumper Configuration” on page 9 shows QMatrix jumper configuration.

Table 3-11. QMatrix Jumper Configuration

Jumper [silk text]	Pin on SAM R21	Function	Position
J218 [RGB RED]	PA16	X[4]	Open
J219 [RGB GREEN]	PA17	X[5]	Open
J220 [RGB BLUE]	PA18	X[6]	Open
J221 [RED LED]	PA19	X[7]	Open

[3] http://www.johansontechnology.com/datasheets/balun-filter/2450BM15A0015.pdf
[4] http://www.skyworksinc.com/uploads/documents/200252C.pdf
[5] http://www.johansontechnology.com/datasheets/antennas/2450AT18A100.pdf
[6] http://www.atmel.com/Images/doc8345.pdf
[7] https://www.hirose.co.jp/cataloge_hp/e35801505.pdf
[8] http://www.skyworksinc.com/uploads/documents/200252C.pdf
[9] http://www.atmel.com/images/doc10752.pdf

Table 3-12, “Slider Configuration” on page 10, Table 3-13, “Button1(CS902) Configuration” on page 10, and Table 3-14, “Button2(CS903) Configuration” on page 10 shows how the button and slider channels are connected to the MCU PTC pins.

Table 3-12. Slider Configuration

Sensor Channel	Pin on SAM R21	Function
Channel1	PA16	X[4]
Channel2	PA17	X[5]
Channel3	PA18	X[6]
Channel4	PA19	X[7]
ChannelY	PA04	Y[2]

Table 3-13. Button1(CS902) Configuration

Sensor Channel	Pin on SAM R21	Function
ChannelX	PA19	X[7]
ChannelY	PA05	Y[3]

Table 3-14. Button2(CS903) Configuration

Sensor Channel	Pin on SAM R21	Function
ChannelX	PA18	X[6]
ChannelY	PA05	Y[3]

3.3.4 RGB LED

The ATSAMR21ZLL-EK kit contains three channel RGB LED in PLCC4 package connected to PWM module of SAM R21 device. Individual LEDs are connnected in current sink configuration to the port pins as given in Table 3-15, “RGB LED Configuration” on page 10.

Table 3-15. RGB LED Configuration

LED Pin	Pin on SAM R21	Function
RGB RED	PA16	TC/TCC
RGB GREEN	PA17	TC/TCC
RGB BLUE	PA18	TC/TCC

3.3.5 OLED Display

The ATSAMR21ZLL-EK Kit contains Passive matrix monochrome OLED module UG-2832HSWEG04. OLED module is interfaced to SAM R21 SERCOM SPI as given in Table 3-16, “OLED Display Interface” on page 10 and Table 3-17, “OLED Display Jumper Configuration” on page 10.

Table 3-16. OLED Display Interface

OLED display Pin	Pin on SAM R21	Function
SDIN	PB02	SERCOM5 MOSI
SCLK	PB03	SERCOM5 SCK
D/C#	PA22	I/O
RESET	PA23	I/O
Chip select	PB22	SERCOM5 SS

Table 3-17. OLED Display Jumper Configuration

Jumper [Silk text]	Pin on SAM R21	Function	Position
J502 [YEL RED]	PB02	SERCOM5 PAD[0]	Open

3.3.6 Joystick

The ATSAMR21ZLL-EK kit contains nine positions for the joystick. Joystick is connected to AIN[6] (PA06) channel of ADC of SAM R21. Value of voltage presented to ADC pin changes with joystick position as given in Table 3-18, “Joystick Position and Voltage” on page 11.

Table 3-18. Joystick Position and Voltage

Joystick position	Pin voltage [V]
NO KEY PRESS	3.3
UP PRESS	0.783
LEFT PRESS	1.108
DOWN PRESS	1.980
RIGHT PRESS	1.815
CENTER PRESS	0.254
UP+LEFT PRESS	0.533
LEFT+DOWN PRESS	0.905
DOWN+RIGHT PRESS	1.328
RIGHT+UP PRESS	0.656

3.3.7 Serial Flash

The ATSAMR21ZLL-EK kit contains 4Mb serial flash memory, M25P40. Flash is connected to the SERCOM SPI of SAM R21 device as given in Table 3-19, “Serial Flash Configuration” on page 11.

Table 3-19. Serial Flash Configuration

M25P40 Pin	Pin on SAM R21	Function
clock(C)	PA09	SERCOM2 SPI SCK
data input(DQ0)	PA08	SERCOM2 SPI MOSI
data output(DQ1)	PA15	SERCOM2 SPI MISO
chip select(S#)	3.3V DC supply	Pullup
write protect(W#)	3.3V DC supply	Pullup
HOLD	3.3V DC supply	Pullup

3.3.8 Temperature Sensor

The ATSAMR21ZLL-EK kit contains NTC thermistor B57421V2103H62. Thermistor is connected to PA07 of SAM R21, which is AIN [7] of ADC peripheral.

3.3.9 Crypto Authentication

The ATSAMR21ZLL-EK kit contains ATECC108A CryptoAuthentication™ device from Atmel. ATSAMR21ZLL-EK use 3-lead variant of the device with single wire interface (SDA). Serial data (SDA) pin is connected to PB23 of SAM R21. Port pin PB23 is multiplexed with user switch "SW FUNC" (silk text) and crypto device. Switch-"SW FUNC" should not be used while crypto device is being used.

3.3.10 Serial Communication Interface

The ATSAMR21ZLL-EK kit has three serial interfaces, SAM R21 USB, EDBG USB, and 6pin header for FTDI serial cable.

3.3.10.1 SAM R21 USB Interface

USB peripheral of SAM R21 is available on the "USB MCU" (silk text) header.

3.3.10.2 EDBG CDC Interface

UART peripheral of SAM R21 is interfaced to UART of EDBG and supports CDC interface through "USB EDBG" (silk text) header. SERCOM3 UART and SERCOM5 UART of SAM R21 is available for the EDBG CDC interface using jumper configurations given in Table 3-20, “SERCOM3 -

EDBG_CDC Jumper Configuration" on page 12 and Table 3-21, "SERCOM5 - EDBG_CDC Jumper Configuration" on page 12.

Table 3-20. SERCOM3 - EDBG_CDC Jumper Configuration

Jumper [Silk text]	Jumper pin Short [Silk text]	EDBG signal	Pin on SAM R21[function]
J203 [S3 RX]	1-2 [EDBG]	EDBG CDC TX	PA28 [SERCOM3 RX]
J204 [S3 TX]	1-2 [EDBG]	EDBG CDC RX	PA27 [SERCOM3 TX]
J201 [S3 CTS]	1-2 [EDBG]	EDBG CDC RTS	PA25 [SERCOM3 CTS]
J202 [S3 RTS]	1-2 [EDBG]	EDBG CDC CTS	PA24 [SERCOM3 RTS]

Table 3-21. SERCOM5 - EDBG_CDC Jumper Configuration

Jumper [Silk text]	Jumper pin short [Silk text]	EDBG signal	Pin on SAM R21[function]
J207 [S5 RX]	1-2 [EDBG]	EDBG CDC TX	PB03 [SERCOM5 RX]
J206 [S5 TX]	1-2 [EDBG]	EDBG CDC RX	PB02 [SERCOM5 TX]
J201 [S3 CTS]	1-2 [EDBG]	EDBG CDC RTS	PA25 [SERCOM5 CTS]
J202 [S5 RTS]	1-2 [EDBG]	EDBG CDC CTS	PA24 [SERCOM5 RTS]

3.3.10.3 Serial (UART) Interface

UART peripheral of SAM R21 is interfaced to 6-pin header compatible to FTDI Serial cable. SERCOM3 or SERCOM5 can be interfaced to the header using jumper configuration as described in Table 3-22, "SERCOM3 - FTDI_Serial Jumper Configuration" on page 12 and Table 3-23, "SERCOM5 - FTDI_Serial Jumper Configuration" on page 12.

Serial header pin names are detailed in "Serial Header" on page 7.

Table 3-22. SERCOM3 - FTDI_Serial Jumper Configuration

Jumper [Silk text]	Jumper Short [Silk text]	Header [pin]signal	Pin on SAM R21[function]
J203 [S3 RX]	2-3 [FTDI]	[4]TX	PA28 [SERCOM3 RX]
J204 [S3 TX]	2-3 [FTDI]	[5]RX	PA27 [SERCOM3 TX]
J201 [S3 CTS]	2-3 [FTDI]	[6]RTS	PA25 [SERCOM3 CTS]
J202 [S3 RTS]	2-3 [FTDI]	[2]CTS	PA24 [SERCOM3 RTS]

Table 3-23. SERCOM5 - FTDI_Serial Jumper Configuration

Jumper [Silk text]	Jumper Short [Silk text]	Header [pin]signal	Pin on SAM R21[function]
J207 [S5 RX]	2-3 [FTDI]	[4]TX	PB03 [SERCOM5 RX]
J206 [S5 TX]	2-3 [FTDI]	[5]RX	PB02 [SERCOM5 TX]
J201 [S3 CTS]	2-3 [FTDI]	[6]RTS	PA25 [SERCOM5 CTS]
J202 [S5 RTS]	2-3 [FTDI]	[2]CTS	PA24 [SERCOM5 RTS]

3.3.11 Mechanical Buttons

ATSAMR21ZLL-EK contains two mechanical buttons with hardware debouncing. RESET button is connected to the SAM R21 reset line and the other is a generic user configurable button. Button input to the MCU is high in open condition. When a button is pressed it will drive the I/O line to ground.

Table 3-24. Mechanical Buttons

Pin on SAM R21	Silk text	Open	Press
RESETN	RESET	3V3DC	ground

Pin on SAM R21	Silk text	Open	Press
PB23	SW FUNC	3V3DC	ground

3.3.12 User LED

Two user LEDs are available on the ATSAMR21ZLL-EK board that can be turned on and off. The LEDs can be activated by driving the connected I/O line high.

Yellow LED is multiplexed with OLED display MOSI and should not be used simultaneously. Yellow LED is multiplexed with OLED display MOSI and should not be used simultaneously. Close the jumper J502 ("YEL LED" silk text) for enabling the LED connection.

RED LED is multiplexed with Touch interface and should not be used simultaneously. Close the jumper J221 ("RED LED" silk text) for enabling the LED connection.

Table 3-25. LED Connections

Pin on SAM R21	LED[silk text]
PB02	Yellow [LED501]
PA19	Red [LED502]

3.3.13 SAM R21 USB

The ATSAMR21ZLL-EK has a Micro-USB receptacle connected to USB peripheral of ATSAMR21G18A.

Table 3-26. USB Connections

Pin on SAM R21	USB
PA24	USB D-
PA25	USB D+

3.3.14 Embedded Debugger Implementation

ATSAMR21ZLL-EK contains an Embedded Debugger (EDBG) that can be used to program and debug the ATSAMR21G18A using Serial Wire Debug (SWD). Atmel Studio can be used as a front end for the Embedded Debugger. The Embedded Debugger also include a Virtual Serial port interface.

The EDBG controls two LEDs on ATSAMR21ZLL-EK; a power LED (Green LED) and a status LED (Yellow LED. The LEDs are placed close to the EDBG USB header (USB_EDBG silk text) on the PCB.

Table 3-27. EDBG LED Control

Operation Mode	Power LED	Status LED
Normal operation	Power LED is lit when power is applied to the board.	Activity indicator, LED flashes every time something happens on the EDBG.
Bootloader mode (idle)	The power LED and the status LED blinks simultaneously.	
Bootloader mode (firmware upgrade)	The power LED and the status LED blinks in an alternating pattern.	

3.3.14.1 Serial Wire Debug

The Serial Wire Debug (SWD) use two pins to communicate with the target.

Table 3-28. SWD Connections

Pin on SAM R21	Function
PA30	SWD clock
PA31	SWD data

3.3.14.2 Virtual COM Port

The Virtual Serial Port is interfaced to a UART port on the ATSAMR21G18A and provides an easy way to communicate with the target application through simple terminal software. It offers variable baud rate, parity, and stop bit settings. EDBG Virtual Serial port supports hardware flow control using RTS and CTS, refer to

“EDBG CDC Interface” on page 11 for jumper configuration. Note that the settings on the target device UART must match the settings given in the terminal software.

3.3.15 MAC ID

ATSAMR21ZLL-EK has 64-bit unique MAC ID stored at memory 0x00804008 of ATSAMR21G18A NVM user row in little endian format.

4. Agency Certification

4.1 United States (FCC)

This equipment complies with Part 15 of the FCC rules and regulations. To fulfill FCC Certification requirements, an OEM manufacturer must comply with the following regulations:

1. This equipment (ATSAMR21ZLL-EK) is for use for evaluation purposes only and must not be incorporated into any other device or system.

Important This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation (FCC 15.19).

The internal / external antenna(s) used for this mobile transmitter must provide a separation distance of at least 20cm from all persons and must not be colocated or operating in conjunction with any other antenna or transmitter.

Installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance. This device is approved as a mobile device with respect to RF exposure compliance, and may only be marketed to OEM installers. Use in portable exposure conditions (FCC 2.1093) requires separate equipment authorization.

Important Modifications not expressly approved by this company could void the user's authority to operate this equipment (FCC section 15.21).

Important This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense (FCC section 15.105).

4.2 European Union (ETSI)

The ATSAMR21ZLL-EK Evaluation kits has been certified for use in European Union countries. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive.

Furthermore, the manufacturer must maintain a copy of the modules' documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.

Important The 'CE' marking must be affixed to a visible location on the OEM product. The CE mark shall consist of the initials "CE" taking the following form:

- The CE marking must have a height of at least 5mm except where this is not possible on account of the nature of the apparatus.
- The CE marking must be affixed visibly, legibly, and indelibly.

More detailed information about CE marking requirements you can find at "DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" on 9 March 1999 at section 12.

4.3 Canada (IC)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with radio frequency exposure limits set forth by Industry Canada for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the device and the user or bystanders.

Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par Industrie Canada pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre le dispositif et l'utilisateur ou des tiers

Important Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

4.4 List of Antennas Tested With This Product

Table 4-1. List of Tested Antennas

Antenna Number	Make	Model/Part #	Antenna Gain (dBi)	Type of Antenna
Antenna 1	Johanson Technology	2450AT18A100	0.5dBi	Ceramic Antenna

Important If professional users including, but not limited to Research and Development engineers wants to configure the power settings higher than those specified in page 7 of the FCC test report number 19660076 001, they are advised to use the antenna / device only in a shielded room.

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. The sticker on ATSAMR21ZLL-EK shows the identifier and revision plain text as *A09-nnnn\rr* where *nnnn* is the identifier and *rr* is the revision. A uniqly assigned MAC64 address in hex, FCC ID and IC id are also printed on the sticker. A serial number string is embedded in the matrix-barcode.

The serial number string has the following format:

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

The kit identifier for ATSAMR21ZLL-EK is 2412.

5.2 Revision 3

Revision 3 of ATSAMR21ZLL-EK (finding the revision number in expalined above) is the initial released version, there are no known issues.

6. Document revision history

Document revision	Date	Comment
42462A	06/2015	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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