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## AVR-IoT WG Development Board Technical Summary

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### Preface

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The AVR-IoT WG development board is a small and easily expandable demonstration and development platform for IoT solutions, based on the AVR<sup>®</sup> microcontroller architecture using Wi-Fi<sup>®</sup> technology. It was designed to demonstrate that the design of a typical IoT application can be simplified by partitioning the problem into three blocks:

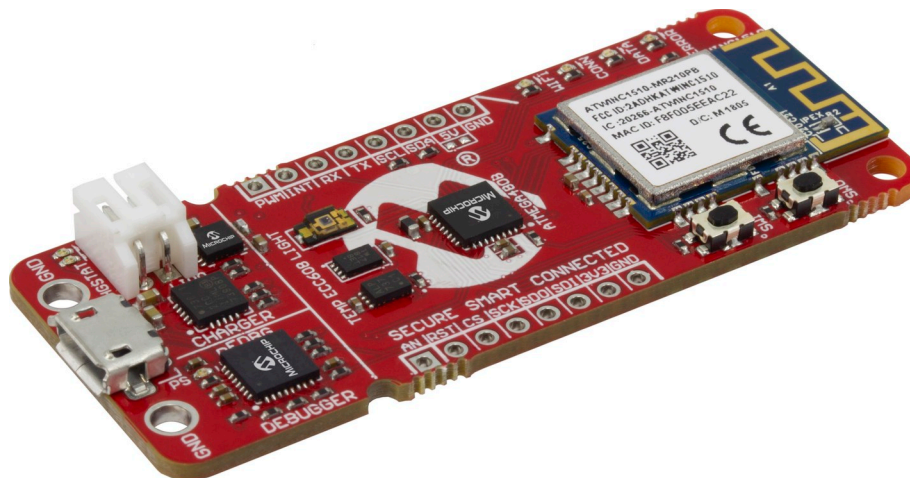
- Smart - represented by the ATmega4808 microcontroller
- Secure - represented by the ATECC608A secure element
- Connected - represented by the WINC1510 Wi-Fi controller module

The AVR-IoT WG development board features a USB interface chip Nano Embedded Debugger (nEDBG) that provides access to a serial port interface (serial to USB bridge), a mass storage interface for easy 'drag and drop' programming, configuration and full access to the AVR microcontroller UPDI interface for programming and debugging directly from Microchip MPLAB<sup>®</sup> X IDE and the Atmel<sup>®</sup> Studio 7.0 IDE. The AVR-IoT WG development board comes preprogrammed and configured for demonstrating connectivity to the Google Cloud IoT Core.

The AVR-IoT WG development board features two sensors:

- A light sensor
- A high-accuracy temperature sensor - MCP9808

Additionally, a mikroBUS<sup>™</sup> connector is provided to expand the board capabilities with 450+ sensors and actuators offered by MikroElektronika ([www.mikroe.com](http://www.mikroe.com)) via a growing portfolio of Click boards<sup>™</sup>.



## Table of Contents

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Preface.....	1
1. Introduction.....	4
1.1. Features.....	4
1.2. Kit Overview.....	4
2. Getting Started.....	6
2.1. Quick Start.....	6
2.2. Design Documentation and Relevant Links.....	6
3. Application User Guide.....	7
4. Hardware User Guide.....	8
4.1. nEDBG.....	8
4.2. Power.....	11
4.3. Connectors.....	12
4.4. Peripherals.....	13
5. Mechanical Drawings.....	17
6. Regulatory Approval.....	18
6.1. United States.....	18
6.2. Canada.....	19
6.3. Taiwan.....	19
6.4. List of Antenna Types.....	19
7. Hardware Revision History.....	20
7.1. Identifying Product ID and Revision.....	20
7.2. Revision 8.....	20
7.3. Revision 7.....	20
7.4. Revision 6.....	20
8. Document Revision History.....	21
The Microchip Web Site.....	22
Customer Change Notification Service.....	22
Customer Support.....	22
Microchip Devices Code Protection Feature.....	22
Legal Notice.....	23
Trademarks.....	23

# AVR-IoT WG Technical Summary

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Quality Management System Certified by DNV.....	24
Worldwide Sales and Service.....	25

## 1. Introduction

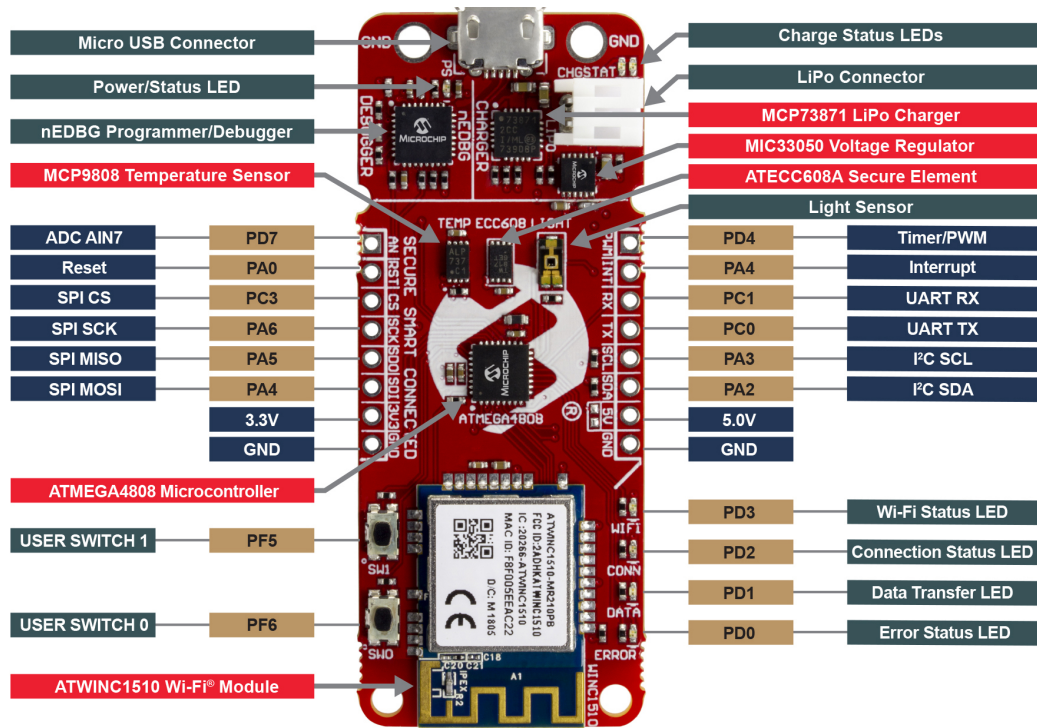
### 1.1 Features

- ATmega4808-MFR Microcontroller
- Four User LED's
- Two Mechanical Buttons
- WINC1510 Wi-Fi Module
- TEMT6000 Light Sensor
- MCP9808 Temperature Sensor
- ATECC608A CryptoAuthentication™ Device
- mikroBUS Header Footprint
- nEDBG
  - Board identification in Atmel Studio and Microchip MPLAB X
  - One green board power and status LED
  - Programming and debugging
  - Virtual COM port (CDC)
  - Two logic analyzer channels (DGI GPIO)
- USB and Battery Powered
- Li-Ion/LiPo Battery Charger
- Fixed 3.3V

### 1.2 Kit Overview

The AVR-IoT WG development kit is a hardware platform to evaluate the ATmega4808 and WINC1510 Wi-Fi module. The figure below show the main features and pinout of the kit.

Figure 1-1. AVR-IoT WG Development Kit Overview



## 2. Getting Started

### 2.1 Quick Start

Steps to start exploring the kit:

1. Connect the kit to your computer.
2. Open the “CLICK-ME.HTM” file on the “CURIOSITY” mass storage disk and follow the instructions.
3. Drag and drop the “WIFI.cfg” configuration file on the “CURIOSITY” drive.  
The device will now connect to your Wi-Fi network and send data to the Google Cloud IoT Core.

### 2.2 Design Documentation and Relevant Links

The following list contains links to the most relevant documents and software for the AVR-IoT WG.

- [AVR-IoT WG website](#) - Kit information, latest user guide and design documentation.
- [AVR-IoT WG on microchipDIRECT](#) - Purchase this kit on microchipDIRECT.
- [Data Visualizer](#) - Data Visualizer is a program used for processing and visualizing data. The Data Visualizer can receive data from various sources such as the EDBG Data Gateway Interface found on Curiosity Nano and Xplained Pro boards and COM Ports.
- [Atmel Studio](#) - Free IDE for the development of C/C++ and assembler code for microcontrollers.
- [MPLAB® X IDE](#) - MPLAB X IDE is a software program that runs on a PC (Windows®, Mac OS®, Linux®) to develop applications for Microchip microcontrollers and digital signal controllers. It is called an Integrated Development Environment (IDE) because it provides a single integrated "environment" to develop code for embedded microcontrollers.
- [IAR Embedded Workbench® for AVR®](#) - This is a commercial C/C++ compiler that is available for 8-bit AVR. There is a 30-day evaluation version as well as a 4 KB code-size-limited kick-start version available from their website.
- <http://microchip.com/start> - Atmel START is an online tool that helps the user to select and configure software components and tailor your embedded application in a usable and optimized manner.
- [Microchip Sample Store](#) - Microchip sample store where you can order samples of devices.

### 3. Application User Guide

The ATmega4808-MFR mounted on AVR-IoT WG is preprogrammed with an application ready to connect to Google Cloud IoT Core. The ATECC608 is preregistered with Google Cloud IoT Core, and the application only needs a Wi-Fi network with an internet connection to stream data to Google Cloud IoT Core. Scan the QR-code on the back of the board, or with instructions on how to connect to a Wi-Fi network open CLICK-ME.HTM in the mass storage USB drive, which opens a page on Google Cloud ready to receive data from your board.

For in-depth information about the preprogrammed demo application and how to develop your own application, see the [AVR-IoT WG Development Board User Guide](#).

## 4. Hardware User Guide

### 4.1 nEDBG

AVR-IoT WG contains an Embedded Debugger (nEDBG) for on-board programming and debugging. The nEDBG is a composite USB device of several interfaces: a debugger, a mass storage device, a data gateway and a Virtual COM port (CDC).

Together with Atmel Studio/MPLAB X, the nEDBG debugger interface can program and debug the ATmega4808.

A Data Gateway Interface (DGI) is available for use with the logic analyzer channels for code instrumentation, to visualize program flow. DGI GPIO's can be graphed using the [Data Visualizer](#).

The Virtual COM port is connected to a UART on the ATmega4808 and provides an easy way to communicate with the target application through terminal software.

The nEDBG controls one Power and Status LED (marked PS) on the AVR-IoT WG board. The table below shows how the LED is controlled in different operation modes.

**Table 4-1. nEDBG LED Control**

Operation mode	Status LED
Boot loader mode	LED blink at 1 Hz during power up.
Power-up	LED is lit - constant.
Normal operation	LED is lit - constant.
Programming	Activity indicator; the LED flashes slowly during programming/debugging with the nEDBG.
Fault	The LED flashes fast if a power fault is detected.
Sleep/Off	LED is off. The nEDBG is either in Sleep mode or powered down. This can occur if the kit is externally powered.

#### 4.1.1 Virtual COM Port

A general purpose USB serial bridge between a host PC and a target device.

##### 4.1.1.1 Overview

nEDBG implements a composite USB device that includes a standard Communications Device Class (CDC) interface, which appears on the host as a Virtual COM Port. The CDC can be used to stream arbitrary data in both directions between the host and the target: characters sent from the host will appear in UART form on the CDC TX pin, and UART characters sent into the CDC RX pin will be sent back to the host.

On Windows machines, the CDC will enumerate as Curiosity Virtual COM Port, and will appear in the Ports section of the device manager. The COM port number is usually shown here.

**Info:** On older Windows systems a USB driver is required for CDC. This driver is included in Atmel Studio and MPLAB X installations.

On Linux machines, the CDC will enumerate and appear as `/dev/ttyACM#`.



On MAC machines, the CDC will enumerate and appear as `/dev/tty.usbmodem#`. Depending on which terminal program is used, it will appear in the available list of modems as `usbmodem#`.

### 4.1.1.2 Limitations

Not all UART features are implemented in the nEDBG CDC - the constraints are outlined here:

- **Baud rate** must be in the range 1200 bps to 500 kbps. Values outside this range will be capped to these values, without warning. Baud rate can be changed on-the-fly.
- **Character format**: only 8-bit characters are supported
- **Parity**: can be odd, even or none.
- **Hardware flow control**: not supported.
- **Stop bits**: one or two bits are supported

### 4.1.1.3 Signaling

During USB **enumeration**, the host OS will start both communication and data pipes of the CDC interface. At this point it is possible to set and read back baud rate and other UART parameters of the CDC, but data sending and receiving will not be enabled.

When a terminal connects on the host, it must assert the **DTR signal**. This is a virtual control signal that is implemented on the USB interface but not in hardware on the nEDBG. Asserting DTR from the host will indicate to the nEDBG that a CDC session is active, and it will enable its level shifters (if available), and start the CDC data send and receive mechanisms.

Deasserting the **DTR signal** will *not* disable the level shifters, but it will disable the receiver, so no further data will be streamed to the host. Data packets that are already queued up for sending to the target will continue to be sent out, but no further data will be accepted.

### 4.1.1.4 Advanced Use

#### CDC Override Mode

In normal operation the nEDBG is a true UART bridge between the host and device. However, under certain use cases the nEDBG can override the Basic Operating mode and use the CDC pins for other purposes.

Dropping a text file (with extension `.txt`) into the nEDBG's mass storage drive can be used to send characters out of the CDC TX pin. The text file must start with the characters:

```
CMD:SEND_UART=
```

The maximum message length is 50 characters - all remaining data in the frame is ignored.

The default baud rate used in this mode is 9600bps, but if the CDC is already active or has been configured, the baud rate last used still applies.

#### USB-level Framing Considerations

**Sending data** from the host to the CDC can be done byte-wise or in blocks, which will be chunked into 64-byte USB frames. Each such frame will be queued up for sending to the CDC TX pin. Sending a small amount of data per frame can be inefficient, particularly at low baud rates, since the nEDBG buffers frames, not bytes. A maximum of 4 x 64-byte frames can be active at any one time, the nEDBG will throttle the incoming frames accordingly. Sending full 64-byte frames containing data is most efficient.

When **receiving data** from the target, the nEDBG will queue up incoming bytes into 64-byte frames, which are sent to the USB queue for transmission to the host when they are full. Incomplete frames are also pushed to the USB queue at approximately 100ms intervals, triggered by USB start-of-frame tokens.

Up to 8 x 64-byte frames can be active at any one time. If the host, or software running on it, fails to receive data fast enough, an overrun will occur. When this happens the last-filled buffer frame will be recycled instead of being sent to the USB queue, and a full frame of data will be lost. To prevent this occurrence, the user must ensure that CDC data pipe is being read continuously, or the incoming data rate must be reduced.

### 4.1.2 Mass Storage Disk

A simple way to program the target device through drag and drop with *.hex*-files.

#### 4.1.2.1 Mass Storage Device

nEDBG implements a highly optimized variant of the FAT12 file-system that has a number of limitations, partly due to the nature of FAT12 itself, and partly due to optimizations made to fulfill its purpose in this development kit.

The CURIOSITY drive *is* USB Chapter 9 compliant as a mass storage device, but does not in any way fulfill the expectations of a general purpose mass storage device. This behavior is intentional.

The nEDBG enumerates as a Curiosity Nano USB device that can be found in the disk drives section of the Windows device manager. The CURIOSITY drive appears in the file manager and claims the next available drive letter in the system.

The CURIOSITY drive contains approximately 1MB of free space. This does *not* reflect the size of the target device's flash in any way. When programming a HEX file, the binary data is encoded in ASCII with meta data providing a large overhead, so 1MB is a trivially chosen value for disk size.

It is *not* possible to format the CURIOSITY drive. When programming a file to the target, the file name may appear in the disk directory listing - this is merely the operating system's view of the directory, which in reality has not been updated. It is not possible to read out the file contents. Removing and replugging the kit will return the file system to its original state, but the target will still contain the application that has been previously programmed.

To erase the target device, simply copy a text file starting with "CMD:ERASE" onto the disk.

By default the CURIOSITY drive contains several read-only files for generating icons as well as reporting status and linking to further information:

- AUTORUN.ICO - Icon file for the Microchip logo.
- AUTORUN.INF - System file required for Windows Explorer to show the icon file.
- CLICK-ME.HTM - Redirect to the AVR-IoT WG web demo application.
- KIT-INFO.HTM - Redirect to the development board web site.
- KIT-INFO.TXT - Text file containing details about the kit firmware, name, serial number, and device.
- PUBKEY.TXT - Text file containing the public key for data encryption.
- STATUS.TXT - Text file containing the programming status of the board.

**Info:** When STATUS.TXT is updated by the nEDBG dynamically, the contents may be cached by the OS and not reflect the correct status.

### 4.1.2.2 Configuration Words / Fuse Bytes

#### Fuse Bytes (AVR targets)

nEDBG does *not* mask any fuse bits or combinations when writing fuses. It is not possible to disable UPDI by fuse setting on devices with a dedicated UPDI pin. For devices with a shared/configurable UPDI pin, be sure **not** to select an alternate pin function for UPDI either by fuse setting in Programming mode or by using the I/O view or memory views to modify the memory-mapped fuse values. Disabling UPDI will

render the nEDBG unable to contact the target device — an external programmer capable of 12V UPDI activation will be required.

### 4.1.3 Embedded Debugger Implementation

The AVR-IoT WG implementation of the Embedded Debugger (nEDBG) and the connections to the ATmega4808 device is shown in the table below.

**Table 4-2. nEDBG Connections**

nEDBG Pin	ATmega4808 Pin	Function	Shared Functionality
DBG0	UPDI	Programming and Debugging	-
DBG1	PF6	DGI GPIO1	SW0
DBG2	PF5	DGI GPIO0	SW1
CDC TX	PF1	UART2 RX	-
CDC RX	PF0	UART2 TX	-

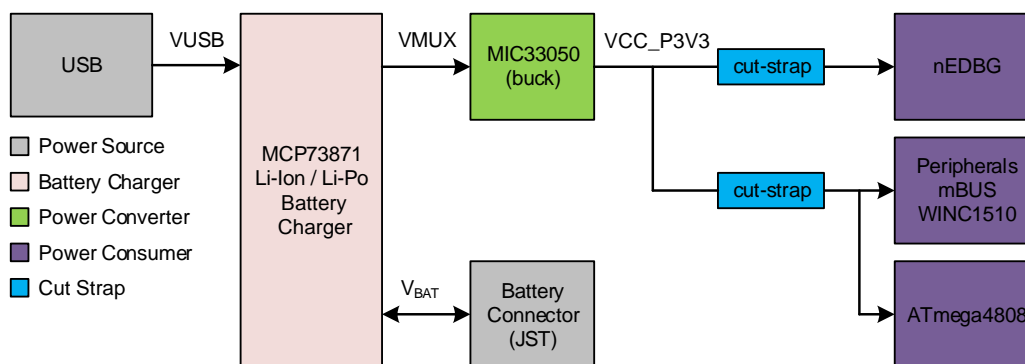
## 4.2 Power

### 4.2.1 Power Source

The kit can be powered through the USB port or by a Li-Ion/LiPo battery. The kit contains one buck converter for generating 3.3V for the debugger, target, and peripherals.

Maximum available current from the USB is limited to 500mA. The current will be shared between charging the battery (if connected) and the target application section.

**Figure 4-1. Power Supply Block Diagram**



### 4.2.2 Battery Charger

AVR-IoT WG features a MCP73871 Li-Ion/LiPo charger and JST battery connector on board. The charger is configured to limit the charge current to 100mA to prevent overcharging of small capacity batteries. Minimum recommended battery capacity is 400mAh.



The MCP73871 has a battery charge voltage of 4.2V. Make sure your battery has the same charge voltage.

**Table 4-3. Charger status LEDs**

LEDs	Function
Red (charging)	The battery is being charged by USB.
Red (discharging)	The battery voltage is low. Triggers if the voltage is under 3.1V.
Green	Charge complete.
Red and Green	Timer Fault. The 6 hour charge cycle has timed out before complete charge.

### 4.2.3 Hardware Modifications

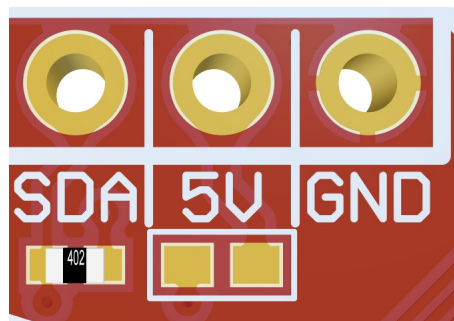
On the bottom side of the AVR-IoT WG board, there are two cut-straps as shown in the figure below. These are intended for current measurement purposes. Do not leave these unconnected as the microcontrollers might get powered through the I/O's.

**Figure 4-2. V<sub>CC</sub> Cut-straps**



To be able to use mikroBUS Click modules that need a 5V supply, some hardware modifications are needed. The 5V supply to the mikroBUS header is not connected by default. To enable 5V to the header, solder in a 0-ohms resistor (0603) or a solder blob over the footprint shown in the figure below.

**Figure 4-3. mikroBUS 5V footprint**



## 4.3 Connectors

### 4.3.1 mikroBUS Socket

AVR-IoT WG features a mikroBUS Socket footprint for expanding functionality of the development kit using MikroElektronika Click Boards and other mikroBUS add-on boards. The footprint is not populated, so it is necessary to solder two 1x8 2.54mm pitch female headers to the kit to use the add-on boards.

**Table 4-4. mikroBUS Socket Pinout**

mikroBUS Socket Pin	ATmega4808 Pin	Function	Shared Functionality
AN	PD7	ADC AIN7	-
RST	PA0	GPIO	-
CS	PC3	GPIO	-
SCK	PA6	SPI0 SCK	WINC1510 SPI
MISO	PA5	SPI0 MISO	WINC1510 SPI
MOSI	PA4	SPI0 MOSI	WINC1510 SPI
+3.3V	V <sub>DD</sub>	VCC_TARGET, 3.3V supply	
GND	GND	Ground	
PWM	PD4	TCA0 WO4	-
INT	PD6	GPIO	-
RX	PC1	UART1 RX	-
TX	PC0	UART1 TX	-
SCL	PA3	TWI0 SCL	MCP9808 and ATECC608A
SDA	PA2	TWI0 SDA	MCP9808 and ATECC608A
+5V		VCC_MUX <sup>1</sup> , MCP73871 output	
GND	GND		



**Info:**

1) A 0-ohm resistor has to be soldered to connect the VCC\_MUX pin to the mikroBUS socket. The pin is not supplied by default to prevent 5V from being connected to any I/O-pins by mistake. For more information see [4.2.3 Hardware Modifications](#).

## 4.4 Peripherals

### 4.4.1 WINC1510 Wi-Fi Module

Microchip's WINC1510 is a low-power consumption 802.11 b/g/n IoT module, specifically optimized for low-power IoT applications. The module integrates Power Amplifier (PA), Low-Noise Amplifier (LNA), switch, power management, and a printed antenna or a micro co-ax (u.FL) connector for an external antenna resulting in a small form factor (21.7 x 14.7 x 2.1 mm) design. It is interoperable with various vendors' 802.11 b/g/n access points. This module provides SPI ports to interface with a host controller.

The WINC1510 provides internal Flash memory as well as multiple peripheral interfaces including UART and SPI. The only external clock source needed for the WINC1510 is the built-in, high-speed crystal or oscillator (26 MHz). The WINC1510 is available in a QFN package or as a certified module.

The communication interface between the ATmega4808 and the WINC1510 Wi-Fi module is SPI, together with some enable signals and interrupt. The rest of the connections are left unconnected.

**Table 4-5. WINC1510 Connections**

WIN1510 Pin	ATmega4808 Pin	Function	Shared Functionality
4 RESET_N	PA1	GPIO	
9 GND	GND		
10 SPI_CFG	VCC_TARGET		-
11 WAKE	PF4	GPIO	-
12 GND	GND		
13 IRQN	PF2	ASYNC EXT INT	-
15 SPI_MOSI	PA4	SPI0 MOSI	<a href="#">mikroBUS</a>
16 SPI_SSN	PA7	SPI0 SS	
17 SPI_MISO	PA5	SPI0 MISO	<a href="#">mikroBUS</a>
18 SPI_SCK	PA6	SPI0 SCK	<a href="#">mikroBUS</a>
20 VBAT	VCC_TARGET		
22 CHIP_EN	PF3	GPIO	
23 VDDIO	VCC_TARGET		
28 GND	GND		
29 PADDLE	GND		

#### 4.4.2 ATECC608A

The ATECC608A is a secure element from the Microchip CryptoAuthentication portfolio with advanced Elliptic Curve Cryptography (ECC) capabilities. With ECDH and ECDSA being built right in, this device is ideal for the rapidly growing IoT market by easily supplying the full range of security such as confidentiality, data integrity, and authentication to systems with MCU or MPUs running encryption/decryption algorithms. Similar to all Microchip CryptoAuthentication products, the new ATECC608A employs ultra-secure, hardware-based cryptographic key storage and cryptographic countermeasures that eliminate any potential backdoors linked to software weaknesses.

The ATECC608A CryptoAuthentication device on the AVR-IoT WG kit is used for storing the private and public key for use with the secure IoT communication.

**Note:** 7-bit I<sup>2</sup>C address: 0x58

**Table 4-6. ATECC608A Connections**

ATECC608A Pin	ATmega4808 Pin	Function	Shared Functionality
SDA	PA2	TWI0 SDA	<a href="#">MCP9808</a> and <a href="#">mikroBUS</a>
SCL	PA3	TWI0 SCL	<a href="#">MCP9808</a> and <a href="#">mikroBUS</a>

### 4.4.3 Temperature Sensor

The MCP9808 digital temperature sensor converts temperatures between -20°C and +100°C to a digital word with  $\pm 0.25^\circ\text{C}/\pm 0.5^\circ\text{C}$  (typical/maximum) accuracy.

Additional Features:

- Accuracy:
  - $\pm 0.25^\circ\text{C}$  (typical) from -40°C to +125°C
  - $\pm 0.5^\circ\text{C}$  (maximum) from -20°C to +100°C
- User Selectable Measurement Resolution: 0.5°C, 0.25°C, 0.125°C, 0.0625°C
- User Programmable Temperature Limits:
  - Temperature Window Limit
  - Critical Temperature Limit
- User Programmable Temperature Alert Output
- Operating Voltage Range: 2.7V to 5.5V
- Operating Current: 200  $\mu\text{A}$  (typical)
- Shutdown Current: 0.1  $\mu\text{A}$  (typical)

The MCP9808 temperature sensor is connected to the ATmega4808 through I<sup>2</sup>C and a GPIO for the user configurable alert output.

**Note:** 7-bit I<sup>2</sup>C address: 0x18

**Table 4-7. MCP9808**

MCP9808 Pin	ATmega4808 Pin	Function	Shared Functionality
SDA	PA2	TWI0 SDA	<a href="#">ATECC608A</a> and <a href="#">mikroBUS</a>
SCL	PA3	TWI0 SCL	<a href="#">ATECC608A</a> and <a href="#">mikroBUS</a>
ALERT	PC2	ASYNC External Interrupt	-

### 4.4.4 Light Sensor

A TEMENT6000X01 light sensor is mounted on the AVR-IoT WG kit for measuring the light intensity. The sensor is a current source that will induce a voltage across the series resistor, which in turn can be measured by the ATmega4808 ADC. The current is exponentially relative to illuminance, from about 10 $\mu\text{A}$ @20lx to 50 $\mu\text{A}$ @100lx. The series resistor has a value of 10k $\Omega$ .

**Table 4-8. Light Sensor Connection**

ATmega4808 Pin	Function	Shared Functionality
PD5	ADC AIN5	-

### 4.4.5 LED

There are four LED's available on the AVR-IoT WG board that can be controlled with PWM or GPIO. The LED's can be activated by driving the connected I/O line to GND.

**Table 4-9. LED Connections**

ATmega4808 Pin	Function	Description
PD0	TCA0 WO0	Red LED
PD1	TCA0 WO1	Yellow LED
PD2	TCA0 WO2	Green LED
PD3	TCA0 WO3	Blue LED

### 4.4.6 Mechanical Buttons

AVR-IoT WG contains two mechanical buttons. These are generic user configurable buttons. When a button is pressed it will drive the I/O line to GND.



**Info:** There are no pull-up resistors connected to the generic user buttons. Remember to enable the internal pull-up in the ATmega4808 to use the buttons.

**Table 4-10. Mechanical Button**

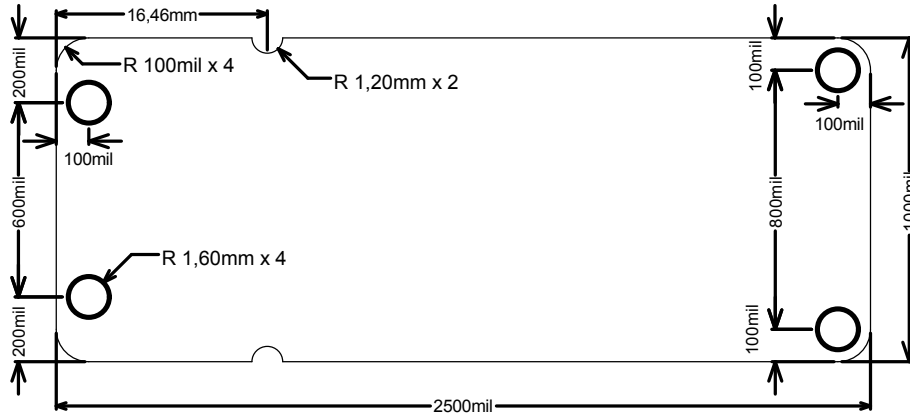
ATmega4808 Pin	Description	Shared Functionality
PF6	User switch 0 (SW0)	<a href="#">EDBG DGI GPIO0</a>
PF5	User switch 1 (SW1)	<a href="#">EDBG DGI GPIO1</a>



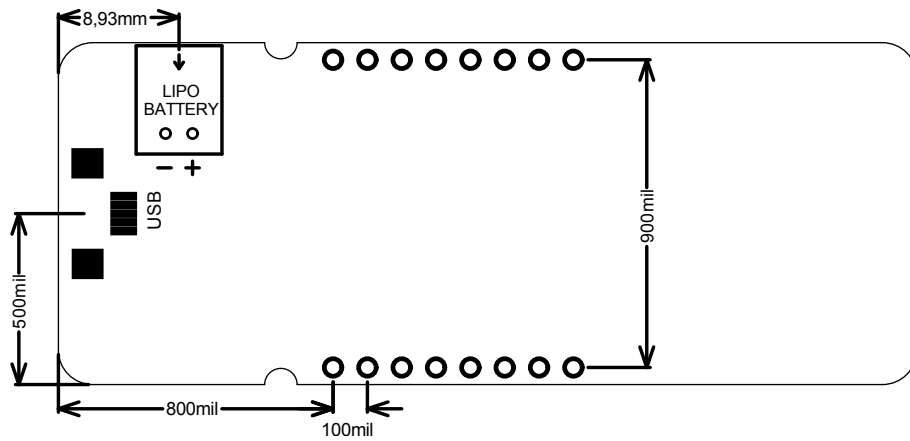
### 5. Mechanical Drawings

The figures below shows the board mechanical drawing and connector placement.

**Figure 5-1. Mechanical Drawing**



**Figure 5-2. Connector Placement**



## 6. Regulatory Approval

The AVR-IoT WG development board has been tested in accordance with the following standards:

Emission:

- FCC Part 15 subpart B:2018 (Class B)
- EN55032:2015 (Class B)

Immunity:

- EN55024:2010+A1:2015
- EN61000-4-2:2009 (contact: level 2 ( $\pm 4$ kV), air: level3 ( $\pm 8$ kV))
- EN61000-4-3:2006+A2:2010 (80 - 1000 MHz, level 2 (3V/M))
- EN61000-4-8:2010 (level 2 (3A/m), continuous field)

The development board contains the wireless transmitter module ATWINC1510-MR210PB, which has the following approval and/or registrations:

- United States/FCC ID: 2ADHKATWINC1510
- Canada
  - IC: 20266-ATWINC1510
  - HVIN: ATWINC1510-MR210PB
  - PMN: ATWINC1510-MR210PB
- Europe - CE
- Japan/MIC: 005-101762
- Korea/KCC: R-CRM-mcp-WINC1510MR210P
- Taiwan/NCC: CCAN18LP0320T0
- China/SRRC: CMIIT ID: 2018DJ1310

### 6.1 United States

Contains Transmitter Module FCC ID: 2ADHKATWINC1510

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

### 6.2 Canada

Contains IC: 20266-ATWINC1510

This device complies with Industry Canada's license 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.

Guidelines on Transmitter Antenna for License Exempt Radio Apparatus:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

### 6.3 Taiwan

Contains module: CCAN18LP0320T0

注意！

依據 低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

### 6.4 List of Antenna Types

ATWINC1510-MR210 does not allow use of external antennas, and is tested with the PCB antenna on the module.

## 7. Hardware Revision History

This user guide provides the latest available revision of the kit. This chapter contains information about known issues, a revision history of older revisions, and how older revisions differ from the latest revision.

### 7.1 Identifying Product ID and Revision

The revision and product identifier of Curiosity Nano boards can be found in two ways; either through Atmel Studio/MPLAB X or by looking at the sticker on the bottom side of the PCB.

By connecting a Curiosity Nano board to a computer with Atmel Studio/MPLAB X 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.

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 AVR-IoT WG is A09-3203.

### 7.2 Revision 8

The Wi-Fi module WINC1510 order code used on revision 8 is ATWINC1510-MR210PB1961 (firmware 19.6.1).

### 7.3 Revision 7

Revision 7 is the initial revision available on microchipDIRECT.

The Wi-Fi module WINC1510 order code used on revision 7 is ATWINC1510-MR210PB1952 (firmware 19.5.2). The firmware was upgraded to version 19.6.1 in production.

### 7.4 Revision 6

Revision 6 is the early adopter revision. It does not have the MCP73871 Li-Ion/LiPo charger or battery connector components mounted, and can only be powered through USB.

The Wi-Fi module WINC1510 order code used on revision 6 is ATWINC1510-MR210PB1952 (firmware 19.5.2). The firmware was upgraded to version 19.6.1 in production.

#### Related Links

[4.2.2 Battery Charger](#)

**8. Document Revision History**

Doc. rev.	Date	Comment
A	010/2018	Initial document release.

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