SAM-IoT WG Development Board User Guide

Preface

The SAM-IoT WG development board is a small and easily expandable demonstration and development platform for IoT solutions, based on the ATSAMD21 microcontroller architecture using Wi-Fi® 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 ATSAMD21 microcontroller
- **Secure**: Represented by the ATECC608A secure element
- **Connected**: Represented by the ATWINC1510 Wi-Fi controller module

The SAM-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 ATSAMD21 microcontroller SWD interface for programming and debugging directly from Microchip MPLAB® X IDE. The SAM-IoT WG development board comes preprogrammed and configured for demonstrating connectivity to the **Google Cloud IoT Core**.

The SAM-IoT WG development board features two sensors:

- A light sensor – TEMT6000
- A high-accuracy temperature sensor - MCP9808

Additionally, a mikroBUS™ connector is provided to expand the board capabilities to 450+ sensors and actuators offered by MikroElektronika through a growing portfolio of Click boards™.

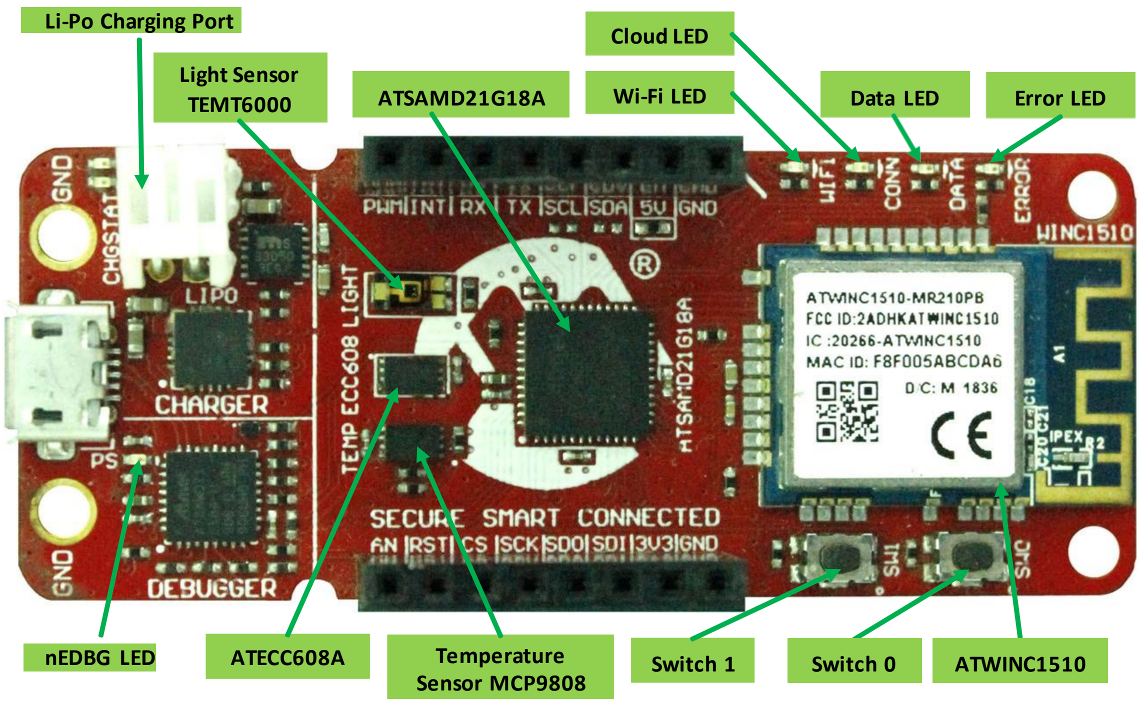
Table of Contents

1. Overview

1.1 Board Layout

The SAM-IoT WG development board layout can be seen in the following figure:

Figure 1-1. Board Layout

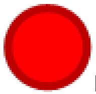


1.2 LED Indicators

The development board features four LEDs that the demonstration code uses to provide diagnostic information as represented in the following table.

Table 1-1. LED Indicators

LED Color	Label	System Element Monitored	Details
Blue	WIFI	Wi-Fi® Network Connection	Indicates a successful connection to the local Wi-Fi® network.
Green	CONN	Google Cloud Connection	Indicates a successful connection to the Google Cloud server.
Yellow	DATA	Data Publication to Server	Indicates that a packet of sensor data has been successfully published to the Google Cloud MQTT server.

...........continued			
LED Color	**Label**	**System Element Monitored**	**Details**
 Red	ERROR	Error Status	Indicates that an error happened after the last step.

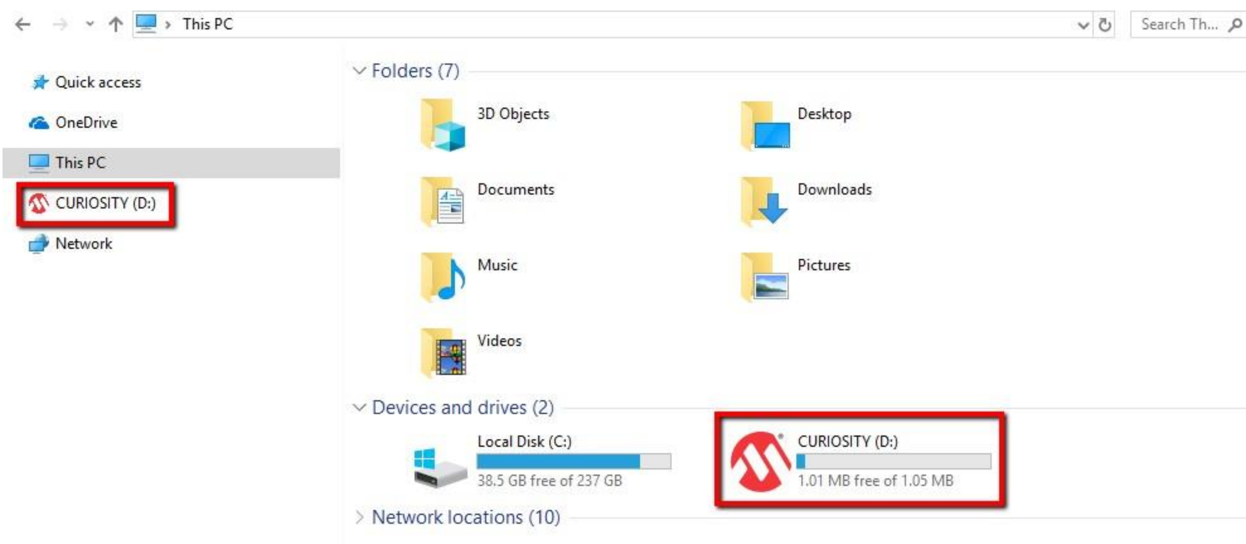
2. Getting Started

2.1 Connecting the Board to the PC

First, connect the SAM-IoT WG development board to the computer using a standard micro-USB cable. Once plugged in, the LED array at the top right-hand corner of the board should flash in the following order twice: Blue, Green, Yellow, Red. If the board is not connected to Wi-Fi, the Red LED will light up. The board should also appear as a Removable Storage Device on the host PC, as shown in the following figure. Double click the **CURIOSITY** drive to open it and get started.

Note: The procedures explained in this section are the same for Windows®, Mac OS®, and Linux® environments.

Figure 2-1. Curiosity Board as Removable Storage



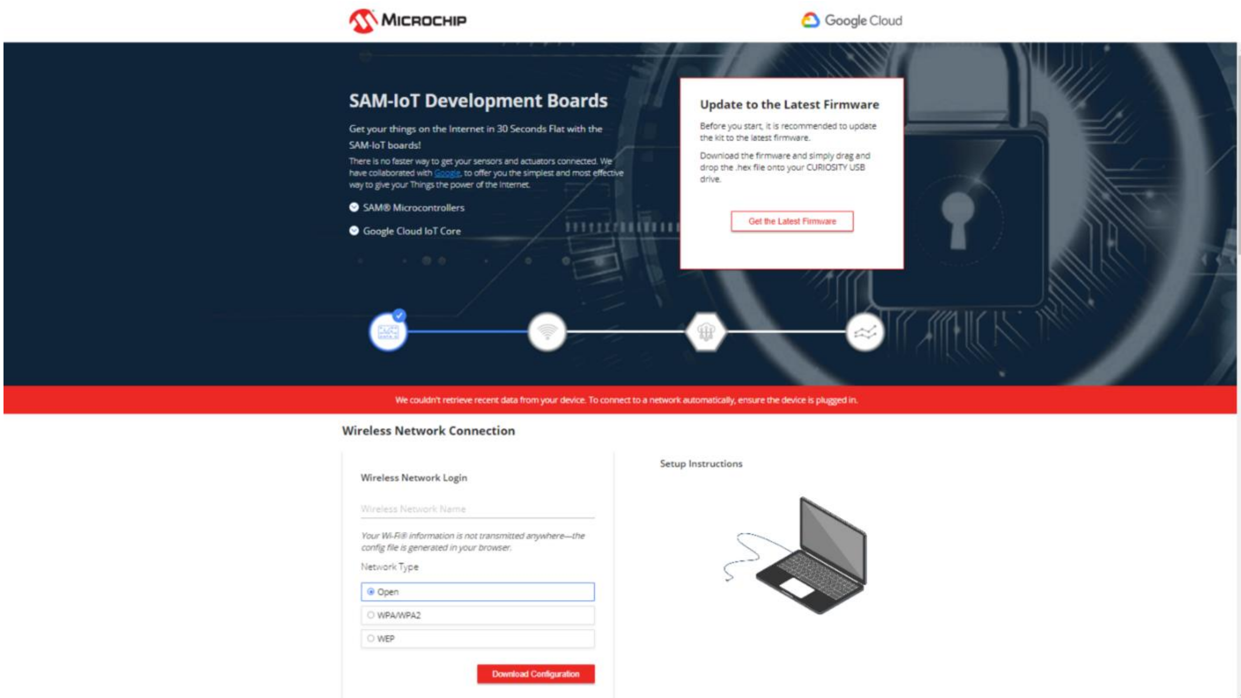
2.1.1 The SAM-IoT WG Experience

The CURIOSITY drive should contain the following five files:

- `CLICK-ME.HTM`: Redirects the user to the SAM-IoT web demo application
- `KIT-INFO.HTM`: Redirects the user to a site containing information and resources about the board
- `KIT-INFO.TXT`: A text file with details about nEDBG firmware and the board's serial number
- `PUBKEY.TXT`: A text file containing the public key used for data encryption
- `STATUS.TXT`: A text file containing the status condition of the board

Double click on the `CLICK-ME.HTM` file to go to the dedicated web page to access the Google Cloud sandbox account. The following figure shows an image of the SAM-IoT WG web page. On this page, the user can quickly see sensor data, reconfigure the Wi-Fi credentials of the board, download additional example codes and customize the application.

Figure 2-2. SAM-Iot WG Web Page (No Wi-Fi Connection)



The status markers at the middle of the page, as shown in the following figure, indicate the progress of the system setup. These markers will light up once each stage is completed successfully. The leftmost marker indicates if the board is connected to the host PC. Next to this, the Wi-Fi marker lights up once the board is connected to a Wi-Fi network, turning on the Blue LED of the board. To the right of the Wi-Fi marker, the Google Cloud MQTT marker can be found, indicating the status of the connection to the Google Cloud server; this corresponds to the Green LED on the board. Finally, the lighting up of the rightmost marker signifies that data is streaming from the board to the server, by blinking the Yellow LED on the board. *If there is no data streaming, the lower right-hand side of the page will be showing the video demonstration of the setup instructions.*

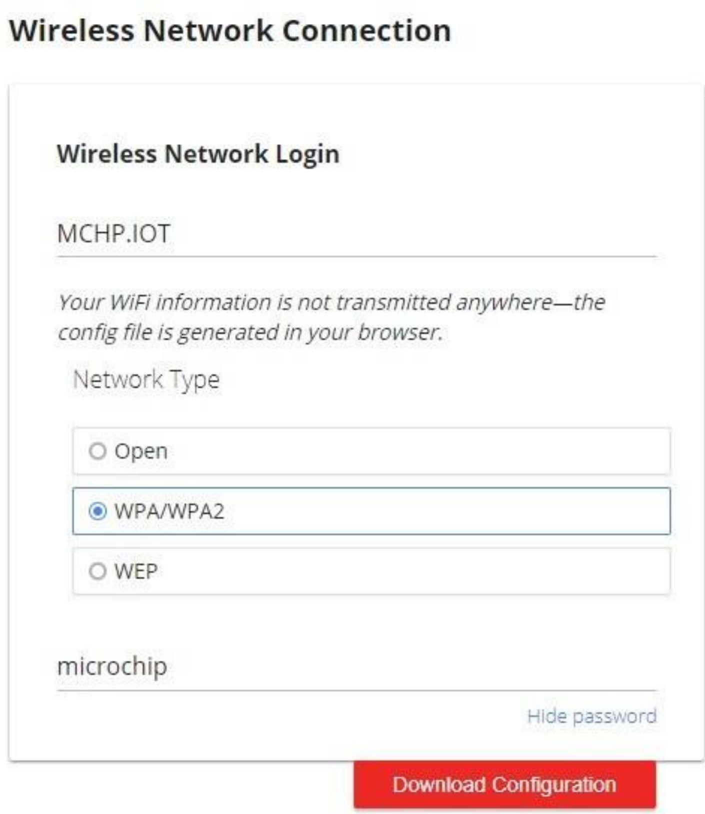
Figure 2-3. Web Page Status Indicators

2.1.2 Connecting to the Wi-Fi Network

When the connection has not been established, the lower left-hand corner of the Microsite will show a wireless network connection window where the user can choose to connect to an Open (no password required) network or enter the credentials for a password protected Wi-Fi network. For the live demonstration, the user needs to fill in the text fields shown in the following figure. These are the details for the Wi-Fi network setup used. For other means of connecting to the internet such as mobile hotspots, the user may fill these fields with the SSID and password of their own Wi-Fi network.

Note: The Wi-Fi network SSID and password are limited to 19 characters. Avoid using quotation marks, names or phrases that begin or end in spaces.

Figure 2-4. Entering Wi-Fi Credentials in Microsite



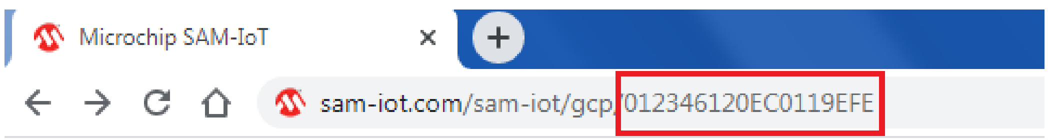
Once the required details are entered, click the **Download Configuration** button. This will download the WIFI.CFG (text) file on the host PC. From the WIFI.CFG's download location, drag and drop the file to the CURIOSITY drive to update the Wi-Fi credentials of the board. The Blue LED will light up to show a successful connection. Otherwise, refer to Troubleshooting for any board issues.

Note: Any information entered in the SSID and password fields is not transmitted over the web or to the Microchip or Google servers. Instead, the information is used locally (within the browser) to generate the WIFI.CFG file.

2.1.3 Security Provisions

The secure element (ATECC608A), on the SAM-IoT WG development board, comes preregistered within the MCHP SAM-IoT (sandbox) account on Google Cloud. Each secure element provides an 18-digit hexadecimal Unique Identification Number (UID) and a public or private key pair, pre-generated using Elliptic Curve Cryptography (ECC). The UID can be seen on the URL of the web page application or through the serial command line interface (discussed later in the document). The private key is never revealed by the secure element, but the public key can be viewed in the PUBKEY.TXT file or through the serial command line interface.

Figure 2-5. Device UID



2.1.4 Visualizing Cloud Data in Real Time

Out of the box, all SAM-IoT development boards are pre-registered to Microchip's Google Cloud sandbox account. This account is set up for demonstration purposes only. All data gathered by the sensors of the SAM-IoT development boards are published on the Microchip sandbox account and can be identified by the following details:

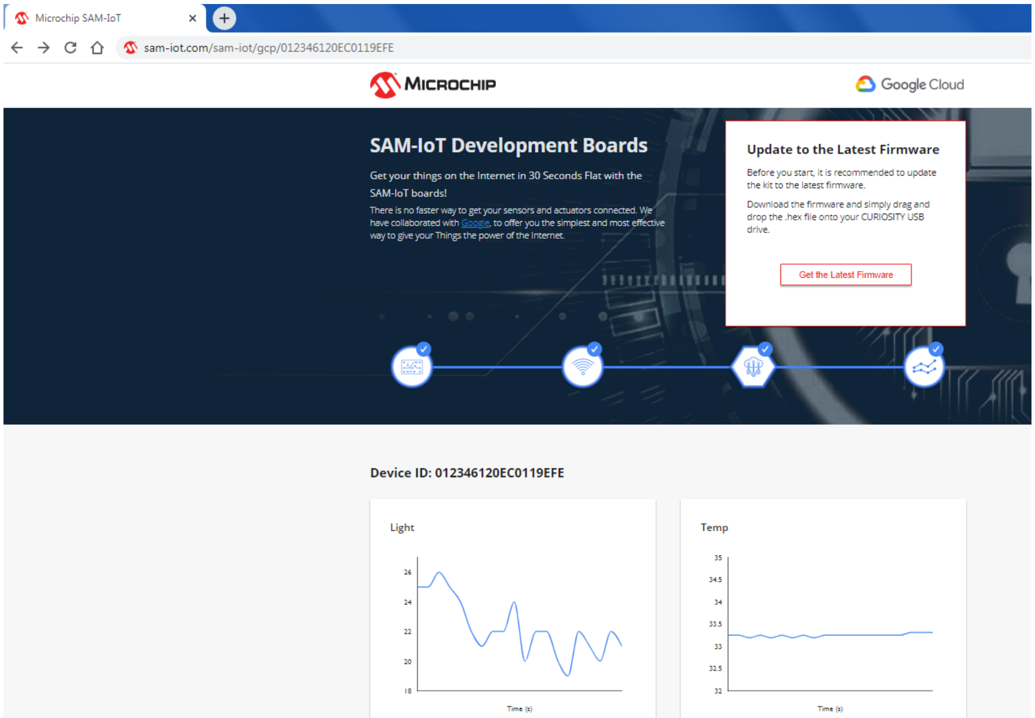
Project ID	pic-iot
Region	us-central1

There is no permanent storage or collection of the data published by the boards connected through the Microchip sandbox account. The full storage of the Google Cloud features will be available to the user after the board is removed from the demonstration environment and migrated to a private account.

Once the board is connected to the Wi-Fi and to the Cloud, the sam-iot.com web page will show a real-time graph of the data gathered from the on-board light and temperature sensors. Data is transferred and transformed from the sensor to the cloud through a JSON object: an ASCII string formatted as follows:

{ 'Light': XXX, 'Temp': YYY }, where XXX and YYY are numerical values expressed in decimal notation.

Figure 2-6. Real-Time Data on the SAM-IoT link



2.1.5 The USB Interface

While the SAM-IoT WG development board comes out of the box fully programmed and provisioned, the user can still access the firmware through the USB interface. There are three methods to do this: through drag and drop, the serial command line interface, or through the on-board programmer/debugger using MPLAB X IDE v5.30 or later.

USB Mass Storage ('Drag and Drop')

One way to program the device is to just drag and drop a `.hex` file into the CURIOSITY drive. The XC32 C compiler tool chain generates a `.hex` file for each project it builds. This `.hex` file contains the code of the project. The SAM-IoT WG board facilitates putting code into the board by having this drag and drop feature. This feature does not require any USB driver to be installed and works in all major OS environments. In an alternative application example, `hex` files for the board firmware will be available for download from the downloads section at the bottom of the sam-iot.com web page.

Serial Command Line Interface

The SAM-IoT WG development board can also be accessed through a serial command line interface. This interface can be used to provide diagnostic information. To access this interface, use any preferred serial terminal application (i.e. PuTTy, Realterm) and open the serial port labeled Curiosity Virtual COM port, with the following settings:

Baud Rate	9600
Data	8-bit
Parity Bit	None
Stop Bit	1 bit
Flow Control	None
Additional Settings	Local Echo: On
Transmit to the Microcontroller	CR+LF (Carriage Return + Line Feed)

Note:
For users of the Windows environment, the USB serial interface requires the installation of an USB serial port driver.

The user can control the board by typing the command keywords, listed in the following table.

Table 2-1. Serial Command Line Commands

Command	Arguments	Description
reset	-	Reset the settings on the device
device	-	Print the unique device ID of the board
key	-	Print the public key of the board
reconnect	-	Re-establish connection to the Cloud
version	-	Print the firmware version of the serial port user interface
cli_version	-	Print the command line interface firmware version of the serial port user interface
wifi (see Figure 2-8 for example)	<Network SSID>, <Password>, <Security Option[(A)]>	Enter Wi-Fi® network authentication details
debug (see Figure 18/19 for sample of debug messages)	<Debug Options[(B)]>	Print debug messages to see status of board operation

Notes:

A: Type in one of these three numbers to choose among the following security options:

1. **Open**: Password and Security option parameters are not required. See *Wi-Fi Authentication for Open Networks* below, for an authentication example for open networks.
2. **WPA/WPA2**: Security Option Parameter not required. See *Wi-Fi Authentication for Password-Protected Networks* below, for an authentication example for the WPA/WPA2 networks.
3. **WEP**

B: Type in a number from '0' to '4'. For the number of debug messages with '0', the result is printing no messages, and '4' printing all the messages.

Figure 2-7. Serial Command Line Interface

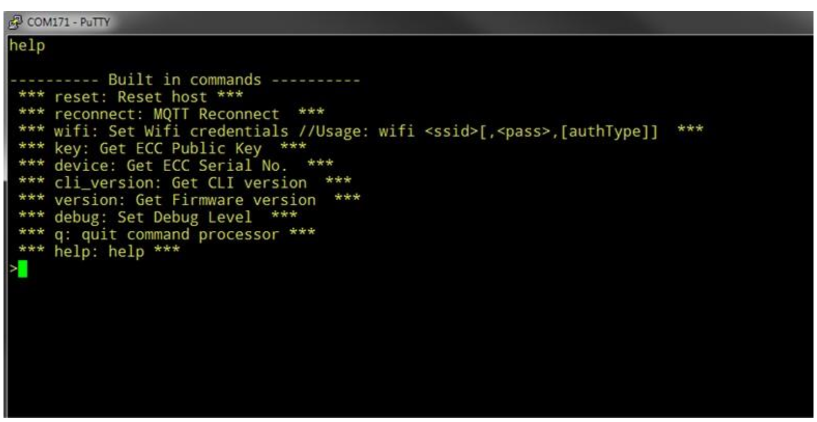


Figure 2-8. Wi-Fi Authentication for Open Networks

Figure 2-9. Wi-Fi Authentication for Password-Protected Networks

USB Programmer/Debugger interface
For users familiar with the MPLAB X interface, the ATSAMD21 microcontroller can also be programmed and debugged directly through the MPLAB X IDE. The SAM-IoT development board is automatically detected by the MPLABX IDE, enabling full programming and debugging through the on-board nEDBG interface.

2.2 SAM-IoT Development on MPLAB Harmony v3

Table 2-2. Software Requirements

Software	Download link
MPLAB® X IDE v5.30 or later	https://www.microchip.com/mplab/mplab-x-ide
XC32-GCC V2.30 or later	https://www.microchip.com/mplab/compilers
MPLAB® Harmony v3 Configurator v3.4.1 or above	www.microchip.com/harmony

MPLAB Harmony v3 is a fully integrated embedded software development framework that provides flexible and interoperable software modules to simplify the development. This framework support for SAM families of Arm Cortex-M based devices. To get started with ATSAMD21 MCUs with MPLAB Harmony v3, you can refer to the training module *Getting started with MPLAB Harmony v3 Peripheral Libraries on SAM D21 MCUs* available in the link https://microchipdeveloper.com/harmony3:samd21-getting-started-training-module.

2.3 Advanced Modes

The SAM-IoT development board can be forced to enter one of a few advanced modes of operation at start-up. These modes can be entered by pressing one or a combination of the push buttons that are present on the board, labeled **Switch 0 (SW0)** and **Switch 1 (SW1)**.

Table 2-3. SAM-IoT WG Advanced Modes

Advanced Mode	Description	Instructions	Physical Indicators
Soft AP mode	Software-Enabled Access mode enables the WINC to be made a wireless access point.	Press and hold SW0 at power-up.	Blinking Blue LED
WINC OTA mode(1)	Enables over-the-air WINC firmware updates.	Press and hold SW1 at power-up.	Blinking Green LED
Bootloader mode(1)	Enables bootloader.	Press and hold SW0 and SW1 at the same time.	Blinking Red LED

Note: 1. Not Implemented.

2.3.1 Soft AP Mode

The SAM-IoT WG development board can be accessed through a Wi-Fi access point enabled by the Software-Enabled Access mode(*) of the ATWINC1510. This can be another way to connect the board to a Wi-Fi network.

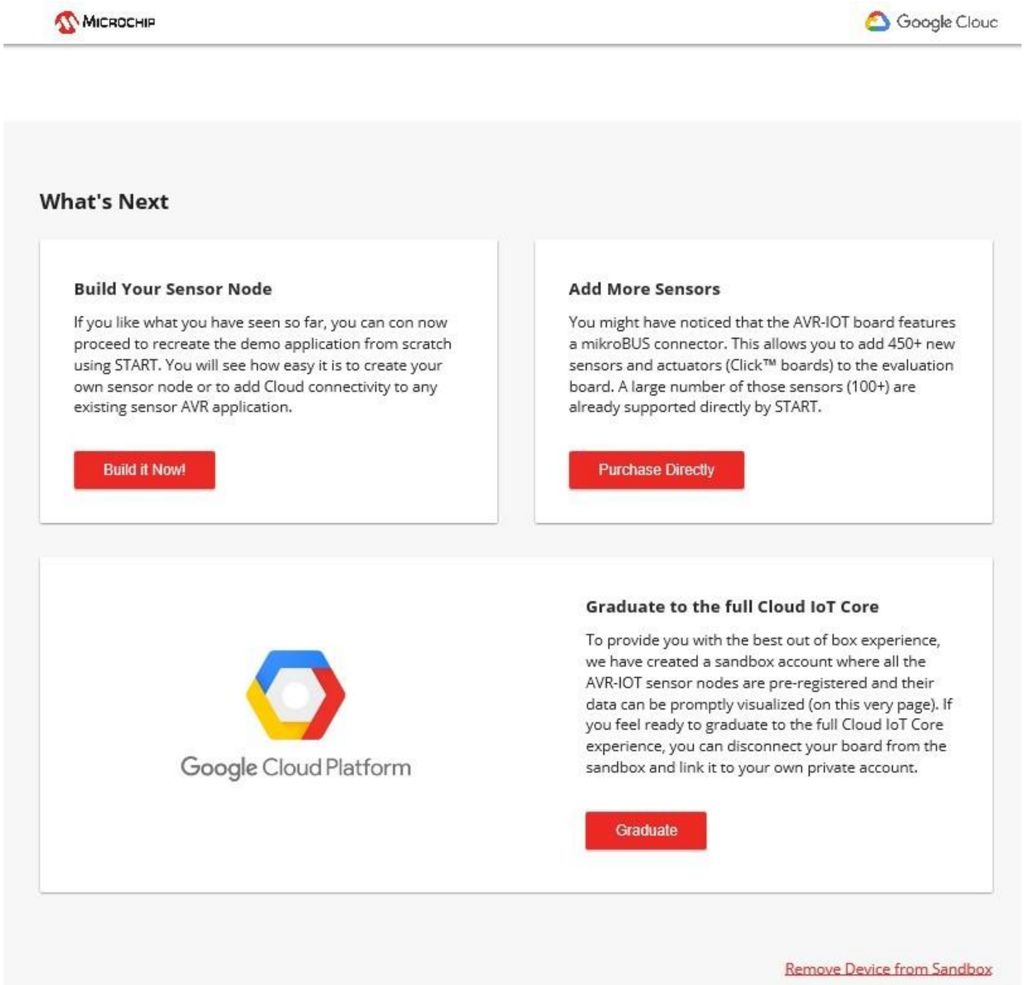
To enter Soft AP mode, press and hold the **SW0 push button** before plugging the board. When connecting to this access point for the first time, the user will need to set the SSID and password of the network to which they are connected. The user should enter these details and then press the **Connect** button. The board is now connected to the network.

* *Soft AP feature is not fully functional with Firmware **v1.0.0**. Please look out for the updates in the link where latest hex files are available for download.*

2.4 Migrating to a Private Google Cloud Account

Once the user is satisfied with the features and capabilities demonstrated by the SAM-IoT WG development board, more information can be obtained by accessing the SAM-IoT WG sandbox. At the bottom of the sam-iot web page, under the **What's Next** section, the user can find the **Graduate to the full Cloud IoT Core** experience option. Clicking the **Graduate** button unregisters the board from the Microchip sandbox account and transfers the users to a GitHub repository, containing the tutorials and files needed to connect the SAM-IoT WG development board to the user's own Google Cloud account.

Figure 2-11. Migrating to a Private Google Cloud Account



3. Troubleshooting

Table 3-1. Troubleshooting and Diagnostics

LED Sequence	Description	Diagnosis	Action
	Only Red LED is On	Board is not connected to Wi-Fi®	Verify Wi-Fi® credentials
	Blue and Red LEDs are On	Board is not connected to Google IoT Cloud servers	• Verify MQTT required ports • Verify project credentials • Check local network firewall settings • Use tethered cellphone or laptop connection for internet
	Blue, Green and Red LEDs are On	Sensor Data are not being published to the Cloud.	• Verify device registration to the project • Check Google account for outages
	Blue and Green LEDs are On and Yellow LED is blinking	Everything is working	Nothing to be done.
	No LED is On	Board is not programmed	Download image `.hex` file from the Downloads section at the bottom of the Microsite page.
 nEDBG	nEDBG LED is Off	Board is not powered	• Check USB connection. • Replace the board.
 nEDBG	nEDBG LED is On but the Curiosity Drive is not found	Faulty USB connection	• Replace the USB connector • Check PC Device Manager

4. Appendix A: Hardware Components

The SAM-IoT WG development board features the following hardware components:

- ATSAMD21G18A Microcontroller
- ATWINC1510 Wi-Fi Module
- TEMT600 Light Sensor
- MCP9808 Temperature Sensor
- Four Light Emitting Diodes (1 each of Blue, Green, Yellow and Red)
- Two Mechanical Buttons
- mikroBUS Header Footprint
- nEDBG Programmer/Debugger

4.1 ATSAMD21G18A

The SAMD21 is a series of low-power microcontrollers using the 32-bit ARM® Cortex®-M0+ processor. It ranges from 32-pins to 64-pins, with up to 256KB, and 32KB of SRAM. ATSAMD21G18A is a 48-pin microcontroller featuring 256KB of Flash and 32KB of SRAM. It is ideal for a wide range of home automation, consumer, metering, and industrial applications.

Figure 4-1. ATSAMD21G18A

4.2 ATWINC1510

Microchip's ATWINC1510 is a low-power consumption 802.11 b/g/n IoT (Internet of Things) module, specifically optimized for low-power IoT applications. The module integrates the following: 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 802.11 b/g/n access points from various vendors. This module provides SPI ports to interface with a host controller. The ATWINC1510 provides internal Flash memory as well as multiple peripheral interfaces, including UART and SPI. The only external clock source needed for the ATWINC1510 is the built-in, high-speed crystal or oscillator (26 MHz). The ATWINC1510 is available in a QFN package or as a certified module.

Figure 4-2. ATWINC1510

4.3 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 MCUs 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, which eliminates any potential backdoors linked to software weaknesses.

Figure 4-3. ATECC608A

4.4 MCP9808 Temperature Sensor

The MCP9808 digital temperature sensor converts temperatures between -20°C and +100°C to a digital world with ±0.25°C/±0.5°C (typical/maximum) accuracy.

Additional Features:

- Accuracy:
  ±0.25°C (typical) from -40°C to +125°C

  ±0.5°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:
  1. Temperature Window Limit
  2. Critical Temperature Limit
- User Programmable Temperature Alert Output
- Operating Voltage Range: 2.7V to 5.5V
- Operating Current: 200 µA (typical)
- Shutdown Current: 0.1 µA (typical)
- 2-wire Interface: I2C/SMBus Compatible
- Available Packages: 2x3 DFN-8, MSOP-8
- AEC-Q100 Qualified Grade 1

Figure 4-4. MCP9808

4.5 nEDBG

The SAM-IoT WG development board 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. Together with MPLAB® X IDE, the nEDBG debugger interface can program and debug the ATSAMD21. The Virtual COM port is connected to a UART on the ATSAMD21 and provides an easy way to communicate with the target application through terminal software. It offers variable baud rate, parity, and Stop bit settings. The nEDBG controls one power and status LED on the SAM-IoT WG development board. The following table shows how the LED is controlled in different operation modes.

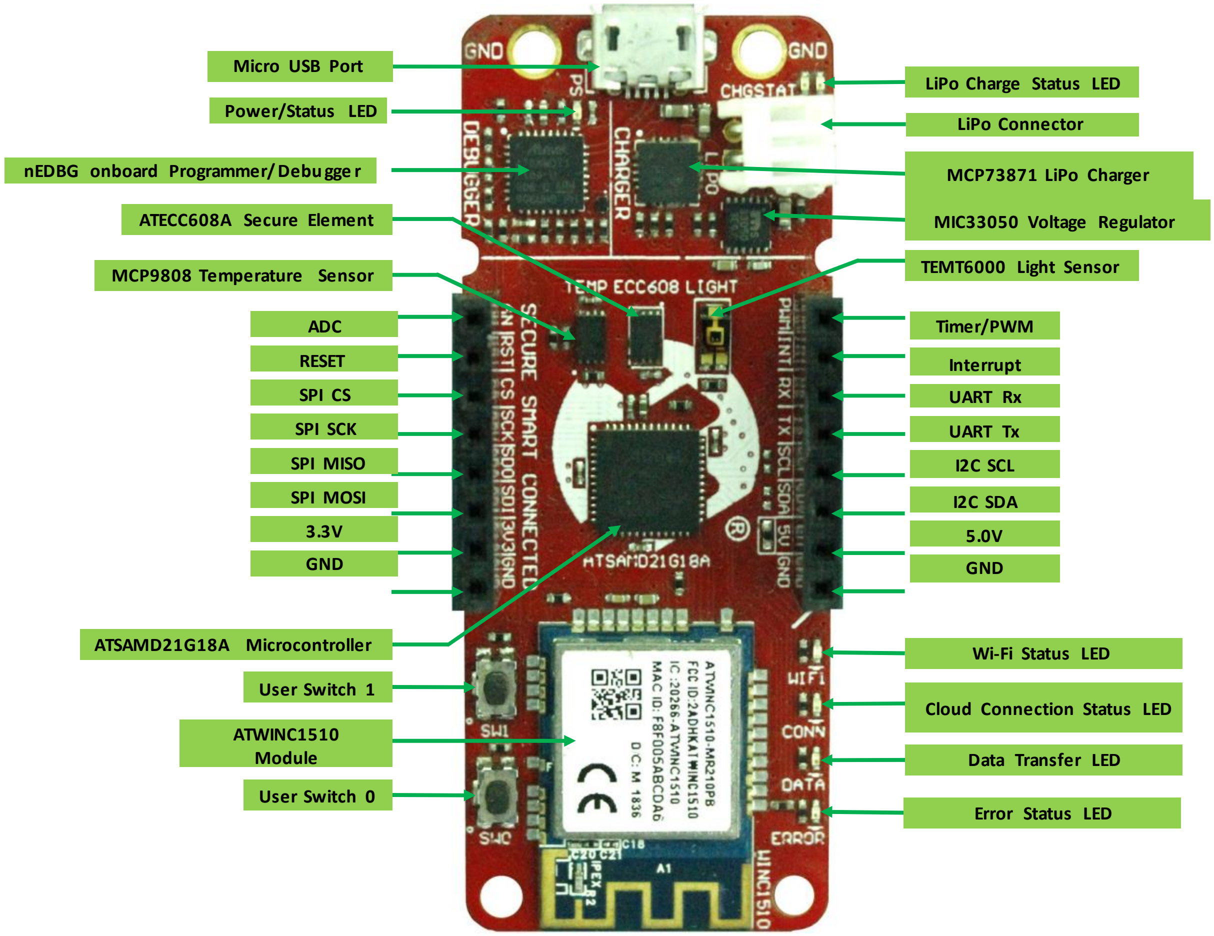
The virtual COM port in the nEDBG requires the terminal software to set the Data Terminal Ready (DTR) signal to enable the UART pins connected to the ATSAMD21. If the DTR signal is not enabled, the UART pins on the nEDBG are kept in high-Z (Tri-state) rendering the COM port unusable. The DTR signal is automatically set by some terminal software, but it may have to be manually enabled in the user's terminal.

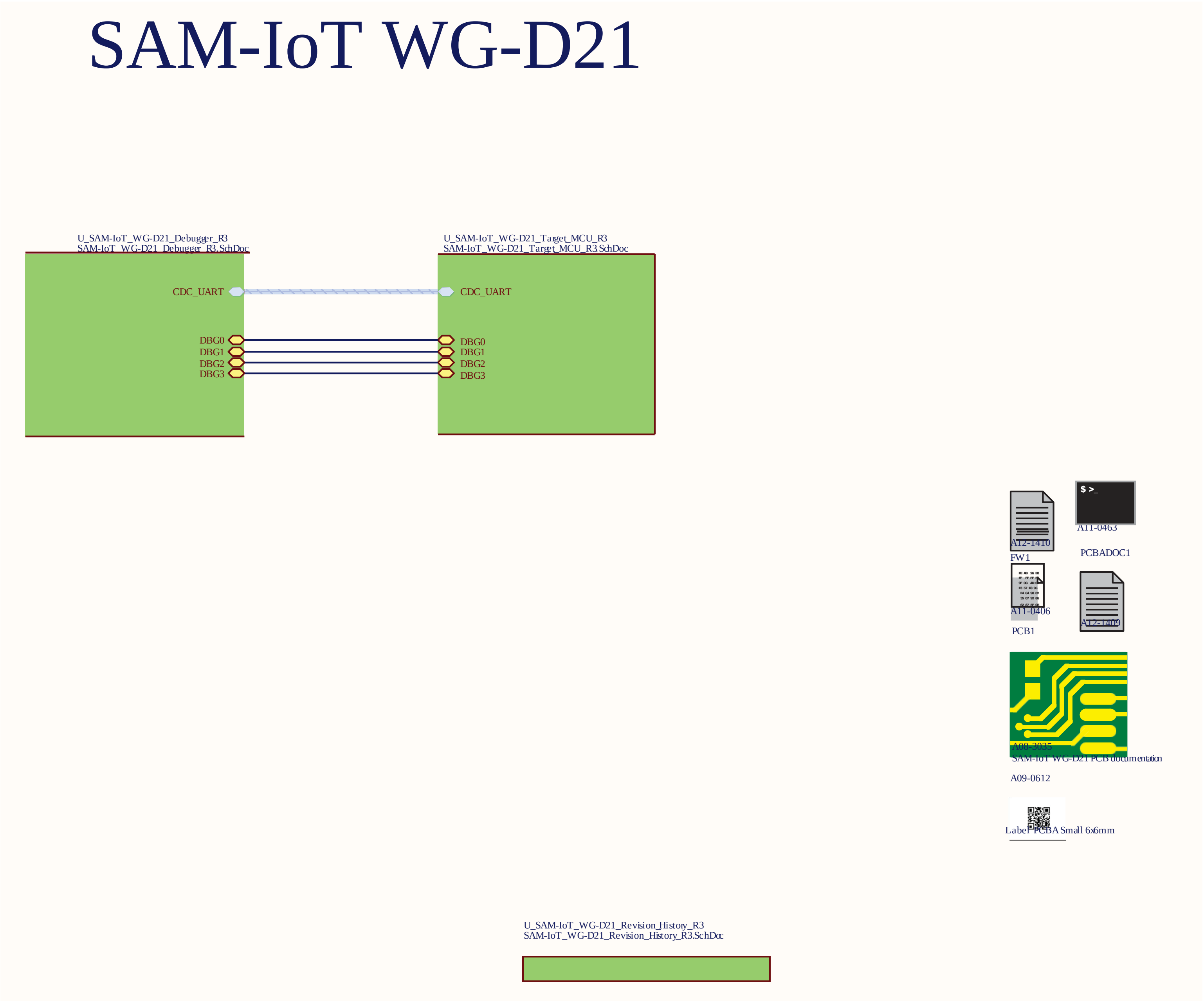
Table 4-1. nEDBG LED Control

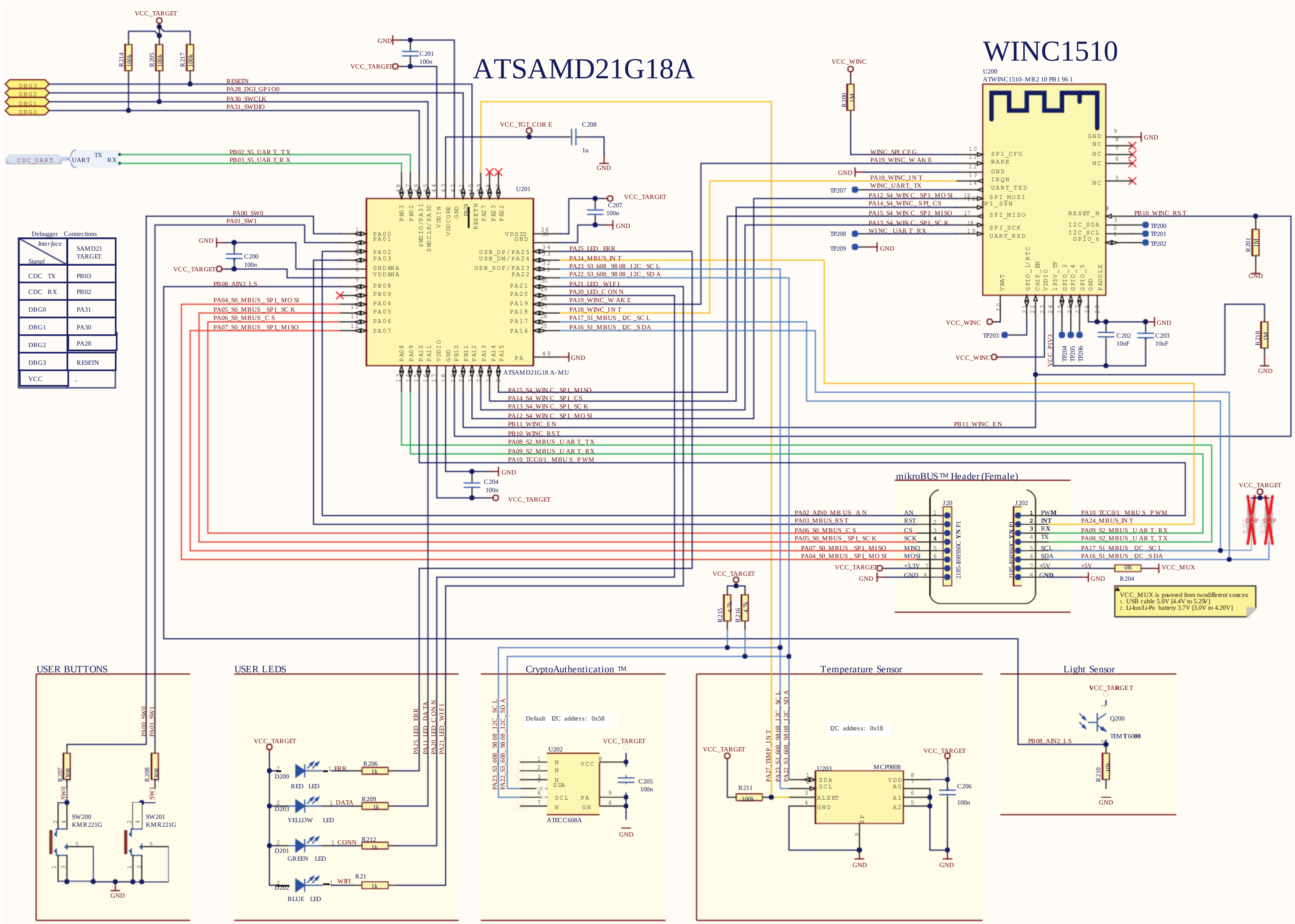
Operation Mode	Status LED
Power-up	LED is lit - constant
Normal operation	LED is lit - constant
Programming	Activity indicator; the LED flashes slowly during programming/debugging with the nEDBG
Fault	The LED flashes fast if a power fault is detected.
Sleep/Off	LED is off. The nEDBG is either in Sleep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

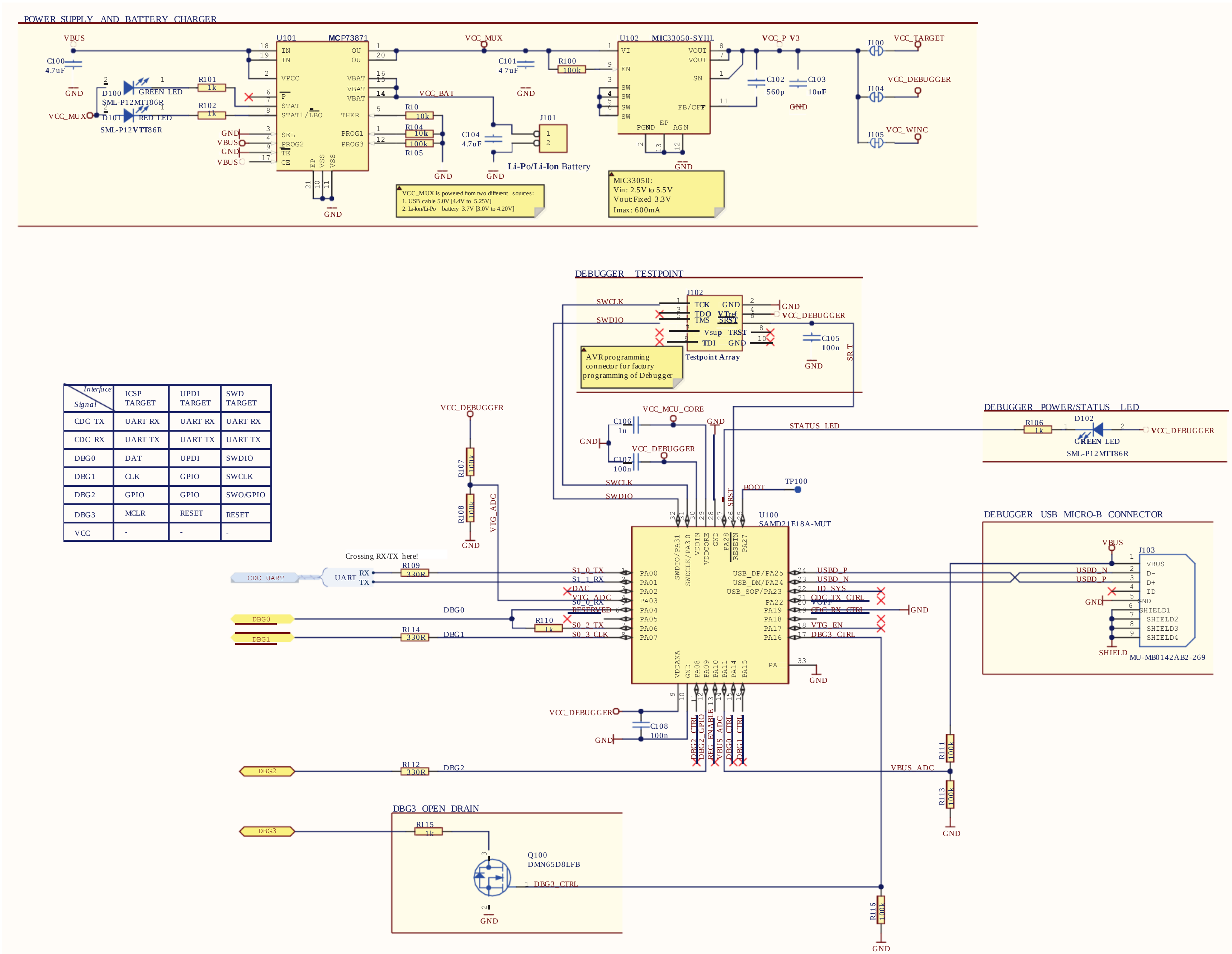
5. Appendix B: Board Layout

Figure 5-1. SAM-IoT WG Development Board Layout




SAM-IoT WG-D21
U_SAM-IoT_WG-D21_Debugger_R3
SAM-IoT_WG-D21_Debugger_R3.SchDoc
CDC_UART
DBG0
DBG1
DBG2
DBG3
U_SAM-IoT_WG-D21_Target_MCU_R3
SAM-IoT_WG-D21_Target_MCU_R3.SchDoc
CDC_UART
DBG0
DBG1
DBG2
DBG3
A12-1410
FW1
A11-0463
PCBADOC1
A11-0406
PCB1
A12-1409
A08-3035
SAM-IoT WG-D21 PCB documentation
A09-0612
Label PCBA Small 6x6mm
U_SAM-IoT_WG-D21_Revision_History_R3
SAM-IoT_WG-D21_Revision_History_R3.SchDoc


ATSAMD21G18A
WINC1510
U201
ATSAMD21G18 A-MU
U200
ATWINC1510-MR2 10 PB1 96 1
Debugger Connections
Interface
Signal
SAMD21 TARGET
CDC TX
PB03
CDC RX
PB02
DBG0
PA31
DBG1
PA30
DBG2
PA28
DBG3
RESETN
VCC
mikroBUS™ Header (Female)
USER BUTTONS
USER LEDS
CryptoAuthentication ™
Temperature Sensor
Light Sensor
Default I2C address: 0x58
I2C address: 0x18
VCC_MUX is powered from two different sources:
1. USB cable 5.0V [4.4V to 5.25V]
2. Li-Ion/Li-Po battery 3.7V [3.0V to 4.20V]
ATECC608A
MCP9808
TEMT6000
RED LED
YELLOW LED
GREEN LED
BLUE LED
SW200 KMR221G
SW201 KMR221G
VCC_TARGET
VCC_WINC
GND



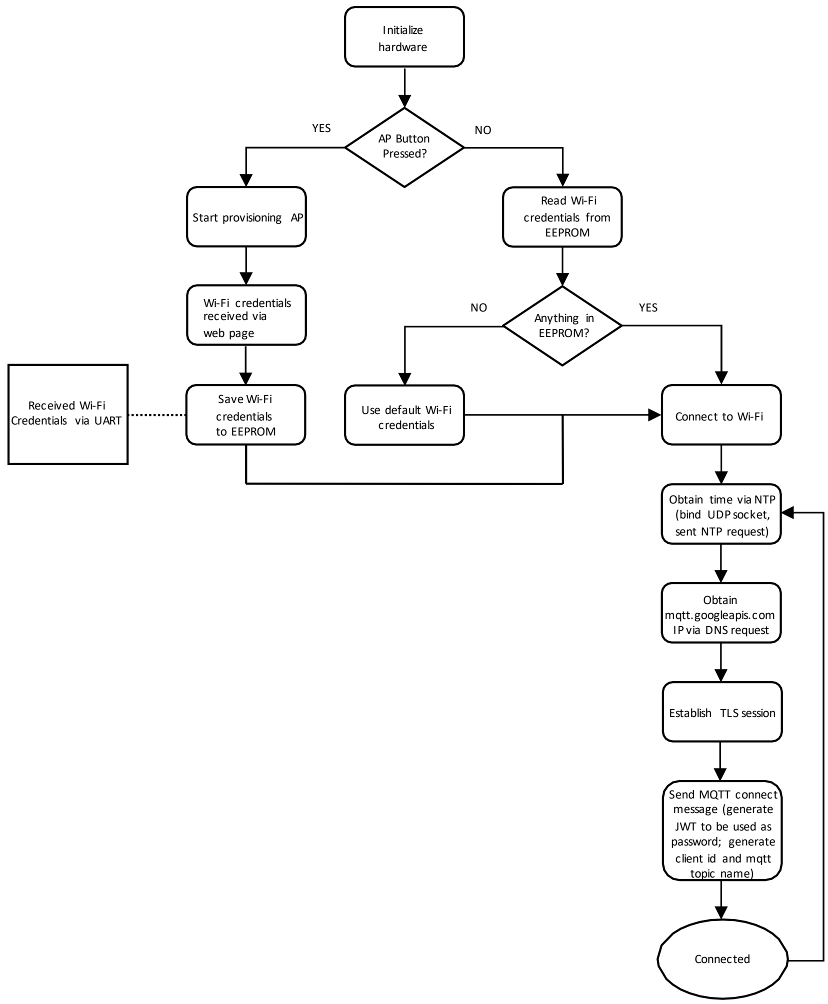
Interface / Signal	ICSP TARGET	UPDI TARGET	SWD TARGET
CDC TX	UART RX	UART RX	UART RX
CDC RX	UART TX	UART TX	UART TX
DBG0	DAT	UPDI	SWDIO
DBG1	CLK	GPIO	SWCLK
DBG2	GPIO	GPIO	SWO/GPIO
DBG3	MCLR	RESET	RESET
VCC	-	-	-

5.2 Bill of Materials

Qty	Designator	Description	Value	Manufacturer	MPN
1	C102	Ceramic capacitor, SMD 0402, X7R, 50V, +/-10%	560p		
2	C103, C203	Ceramic capacitor, SMD 0402, X5R, 6.3V, 20%	10uF	Murata	GRM155R60J106ME15
9	C105, C107, C108, C200, C201, C204, C205, C206, C207	Ceramic capacitor, SMD 0402, X7R, 16V, +/-10%	100n	Kemet	C0402C104K4RACTU
2	C106, C208	Ceramic capacitor, SMD 0402, X5R, 6.3V, +/-10%	1u	Kemet	C0402C105K9PAC
1	C202	Ceramic capacitor, SMD 0402, X7R, 25V, 10%	10nF	Murata	GRM155R71E103KA01D
3	D100, D102, D201	LED, SMD 0402, Green, Wave length=569nm	GREEN LED	ROHM	SML-P12MTT86R
2	D101, D200	LED, SMD 0402, Red, Wave length=630nm	RED LED	ROHM	SML-P12VTT86R
1	D202	LED, SMD 0402, Blue, Wave length=470nm	BLUE LED	ROHM	SMLP13BC8TT86
1	D203	LED, SMD 0402, Yellow, Wave length=586nm	YELLOW LED	ROHM	SML-P12YTT86R
1	J101	Pin Header 1x2, 2mm THM, RA	S2B-PH-K-S	J.S.T. Mfg.	S2B-PH-K-S
2	J201, J202	1x8 receptacle pin header, 2.54mm pitch THM, PIP	2185-108SS0CYNP1	WCON	2185-108SS0CYNP1
1	Q100	N-ch MOSFET, DFN1006-3 (SOT883), 60V, 330mA	DMN65D8LFB	Diodes Inc	DMN65D8LFB-7
1	Q200	light sensor	TEMT6000	Vishay	TEMT6000X01
3	R103, R104, R210	Thick film resistor, SMD 0402, 1/16W, 1%	10k	Yageo	RC0402FR-0710KL
5	R109, R112, R114, R207, R208	Thick film resistor, SMD 0402, 1/16W, 1%	330R	Yageo	RC0402FR-07330RL
3	R200, R201, R218	Thick film resistor, SMD 0402, 1/16W, 1%	1M	ASJ	CR10-1004-FK
1	R204	RES 0.0 OHM 1/16W 0402 SMD	0R	(n/a)	RMCF0402ZT0R00
3	R205, R214, R217	Thick film resistor, SMD 0402, 1/16W, 1%	100k	ASJ	CR10-1003-FK
2	R215, R216	Thick film resistor, SMD 0402, 1/16W, 1%	4.7k	Yageo	RC0402FR-074K7L
2	SW200, SW201	Microminiature Tact Switch for SMT	KMR221G	ITT Corp.	KMR221G
1	U100	Atmel 32-bit RISC MCU 32pin	SAMD21E18A-MUT	Microchip	ATSAMD21E18A-MUT
1	U101	Li-Ion/Li-Polymer Battery Charge Controller	MCP73871	Microchip	MCP73871T-2CCI/ML
1	U102	3.3V Fixed, 4MHz, 600mA, Buck regulator	MIC33050-SYHL	Microchip	MIC33050-SYHL-TR
1	U200	IEEE 802.11 b/g/n module, 8Mbit Flash Memory	ATWINC1510-MR210PB1961	Microchip	ATWINC1510-MR210PB1961
1	U201	MCU 32-BIT 32kB 256kB 48MHz QFN48	ATSAMD21G18A-MU	Microchip	ATSAMD21G18A-MU
1	U202	ATECC608A with an I2C Interface and a 8 Pin UDFN	ATECC608A I2C	Microchip	ATECC608A-MAH1H-S
1	U203	Â±0.5C Digital Temperature Sensor, I2C/SMBus	MCP9808	Microchip	MCP9808T-E/MC

6. Appendix C: Firmware Flowchart

Figure 6-1. SAM-Iot WG Firmware Flowchart



7. Appendix D: Relevant Links

The following list contains links to the most relevant documents and software for the SAM-IoT WG development board. For those accessing the electronic version of this document, the underlined links will redirect to the appropriate website.

- SAM-IoT WG Development Board project source code and application binary
- MPLAB X IDE – A Free IDE to develop applications for Microchip microcontrollers and digital signal controllers
- Microchip Sample Store: Microchip sample store where you can order samples of devices
- MPLAB® Harmony v3
- Getting Started with Harmony v3 Peripheral Libraries on SAM D21 MCUs
- Creating a "Hello World" Application on SAM Microcontrollers Using MPLAB Harmony v3 with MPLAB Harmony Configurator (MHC)
- Introduction to MPLABX IDE and Harmony v3 for Atmel Studio and ASF Users

8. Revision History

Revision A - July 2020

This is the initial release of this document.