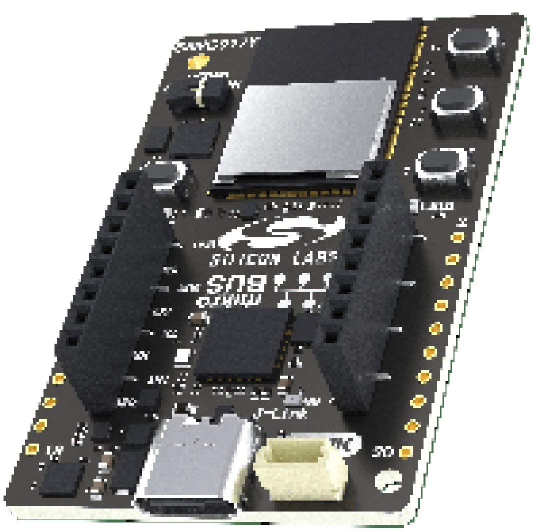
UG590: SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit User's Guide

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit is an ultra-low cost, small form factor development and evaluation platform for the SiWG917Y Wireless Module.

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit is focused on rapid prototyping and concept creation of IoT applications. It is designed around the SiWG917Y module, which is an ideal module family for developing energy-friendly connected IoT applications.

The kit features a USB Type-C interface, an on-board SEGGER J-Link debugger, two user-LEDs and two buttons, and support for hardware add-on boards via a mikroBus socket and a Qwiic connector. The hardware add-on support allows developers to create and prototype applications using a virtually endless combination of off-the-shelf boards from MIKROE, SparkFun, Adafruit, and Seeed Studio.



TARGET DEVICE

- SiWG917Y Wireless Module (SiWG917Y111MGABA)
- High-performance 2.4 GHz radio
- 32-bit ARM® Cortex®-M4 with 180 MHz maximum operating frequency
- 8 MB flash and 8 MB External PSRAM

KIT FEATURES

- 2x User LEDs and push buttons
- 20-pin 2.54 mm breakout pads
- mikroBUS™ socket
- Qwiic® connector
- SEGGER J-Link on-board debugger
- Virtual COM port
- USB-powered

SOFTWARE SUPPORT

- Simplicity Studio™

ORDERING INFORMATION

- SiW917Y-EK2708A

Table of Contents

1. Introduction

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit has been designed to inspire customers to make IoT devices with the Silicon Labs SiWG917Y Wireless Module. The kit includes a mikroBUS™ socket and Qwiic® connector, allowing users to add features to the kit with a large selection of off-the-shelf boards.

Programming the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit is easily done using a USB Type-C cable and the on-board J-Link debugger. A USB virtual COM port provides a serial connection to the target application. Included on the board is a 64 Mbit QSPI PSRAM that can be used for running applications. The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit is supported in Simplicity Studio™ and a Board Support Package (BSP) is provided to give application developers a flying start.

Connecting external hardware to the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit can be done using the 20 breakout pads which present peripherals from the SiWG917Y module such as I^2C, SPI, UART, and GPIOs. The mikroBUS socket allows inserting mikroBUS add-on boards which interface with the SiWG917Y through SPI, UART or I^2C. The Qwiic connector can be used to connect hardware from the Qwiic Connect System through I^2C.

1.1 Kit Contents

The following items are included in the box:

- 1x SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit board (BRD2708A)

1.2 Getting Started

Detailed instructions for how to get started with your new SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit can be found on the Silicon Labs web page: https://www.silabs.com/dev-tools

1.3 Hardware Content

The following key hardware elements are included on the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit:

- SiWG917Y Wireless module with 180 MHz operating frequency
- Memory: 8 MB flash, and 8 MB External On-board PSRAM
- 2.4 GHz matching network and ceramic antenna for wireless transmission
- Two LEDs and two push buttons
- On-board SEGGER J-Link debugger for easy programming and debugging, which includes a USB virtual COM port
- mikroBUS socket for connecting click boards™ and other mikroBUS add-on boards
- Qwiic connector for connecting Qwiic Connect System hardware
- Breakout pads for GPIO access and connection to external hardware
- Reset button
- ISP Mode button

1.4 Kit Hardware Layout

SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit layout is shown below.

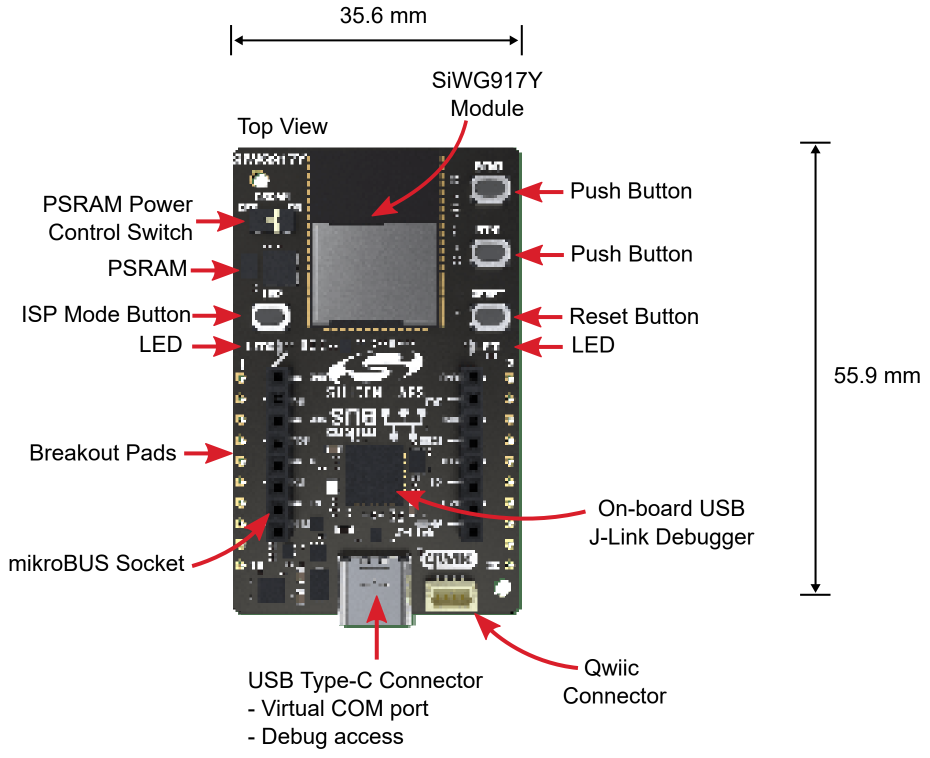


Figure 1.1. SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit Hardware Layout

2. Specifications

2.1 Recommended Operating Conditions

Table 2.1. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
USB Supply Input Voltage	V_{USB}	—	+5.0	—	V
Supply Input Voltage (VMCU supplied externally)	V_{VMCU}	—	+3.3	—	V

2.2 Current Consumption

The operating current of the board greatly depends on the application and the amount of external hardware connected. The table below attempts to give some indication of typical current consumptions for the SiWG917Y and the on-board debugger. Note that the numbers are taken from the data sheets for the devices. For a full overview of the conditions that apply for a specific number from a data sheet, the reader is encouraged to read the specific data sheet.

Table 2.2. Current Consumption

Parameter	Symbol	Condition	Typ	Unit
SiWG917Y Current Consumption[1]	$I_{SiWG917Y}$	Active current at 180 MHz in high-performance mode	50	µA/MHz
		Deep sleep mode current	2.5	µA
QSPI PSRAM Current Consumption [2]	$I_{APS6404L}$	Standby current (standard room temp)	100	µA
On-board Debugger Sleep Current Consumption [3]	I_{DBG}	On-board debugger current consumption when USB cable is not inserted (EFM32GG12 EM4S mode current consumption)	80	nA

1 From SiWG917Y Wireless Module data sheet

2 From APS6404L-3SQR-ZR data sheet

3 From EFM32GG12 data sheet

3. Hardware

The core of the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit is the SiWG917Y Wireless Module. Refer to section 1.4 Kit Hardware Layout for placement and layout of the hardware components.

3.1 Block Diagram

An overview of the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit is illustrated in the figure below.

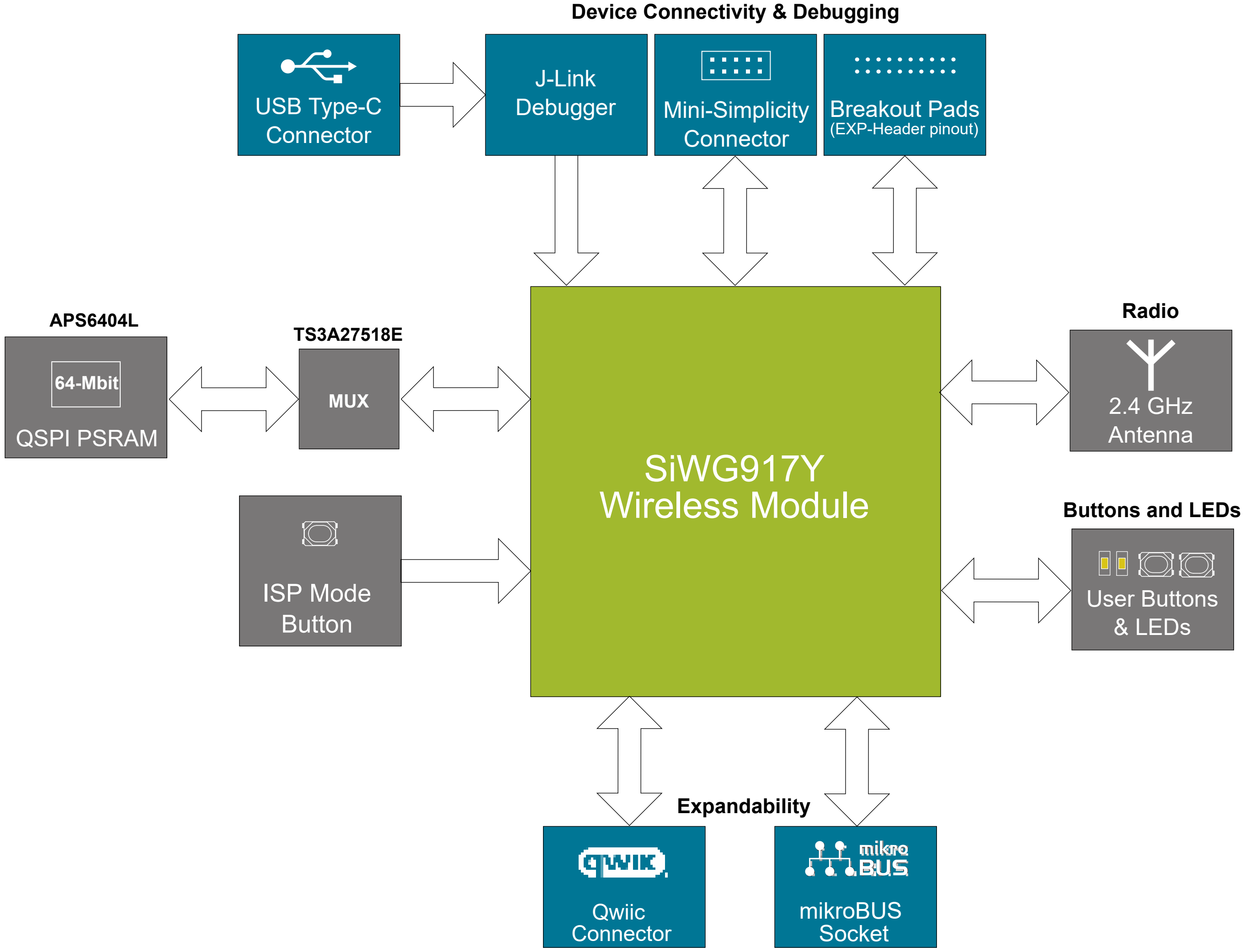


Figure 3.1. Kit Block Diagram

3.2 Power Supply

The kit can be powered through one of these interfaces:

- USB Type-C
- Mini Simplicity connector
- Breakout Pads

The figure below shows the power options available on the kit and illustrates the main system power architecture.

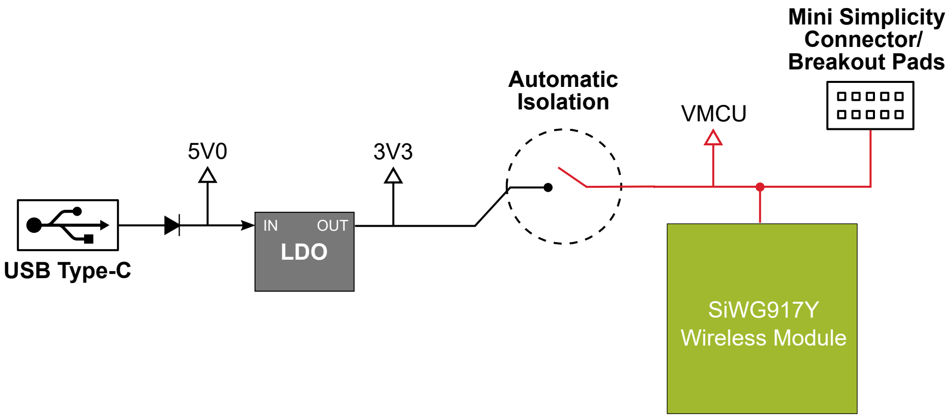


Figure 3.2. SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit Power Architecture

Power is normally applied through the USB cable. When the USB cable is connected, VBUS is regulated down to 3.3 V.

Power can also be applied through the Mini Simplicity connector or Breakout Pads. There must be no other power sources present on the kit as power is injected directly to the VMCU net.

Important: When powering the board through the Mini Simplicity connector (not mounted on the board), the USB power source must be removed.

The power supply options are summarized in the table below.

Table 3.1. SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit Power Options

Supply Mode	Typical Input Voltage	VMCU Source	3V3 Source	5V Source
USB power	5.0 V	On-board regulator	On-board regulator	USB VBUS
Mini Simplicity	3.3 V	Debugger dependent	Disconnected	No voltage present
Breakout Pads	3.3 V	External power supply	Disconnected	No voltage present

3.3 SiWG917Y Reset

The SiWG917Y can be reset by a few different sources:

- A user pressing the RESET button.
- The on-board debugger pulling the #POC_IN pin low.
- An external debugger pulling the #POC_IN pin low.

The figure below shows the reset options available on the kit.

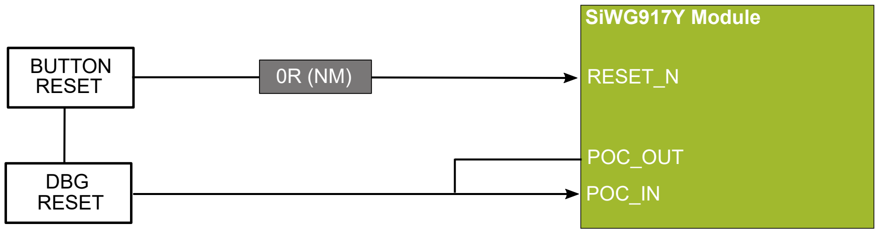


Figure 3.3. SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer KitReset

The Power On Control (POC) has two control options.

POC_OUT Connected to POC_IN:

The POC_IN input of the chip should be made high only after supplies are valid to ensure the IC is in safe state. The POC_IN can be connected externally to the internally generated POC_OUT signal or can be controlled from external source like R/C circuit.

During power up, until the VBATT reaches 1.6 V , the POC_OUT signal stays low. Once the VBATT supply exceeds 1.6 V, the POC_OUT becomes high and the RESET_N is high at least 1.6 ms after VBATT supply is stable.

External Control for POC_IN:

The POC_IN and RESET_N signals can be controlled from an external source like R/C circuits. RESET_N will be pulled low if POC_IN is low. POC_IN should be made high only after supplies are valid to ensure the IC is in safe state. A pull-up R/C circuit is applied across it to provide a delay, so that POC_IN should be high after 0.6 ms and RESET_N should be high after 1 ms of POC_IN high.

3.4 Push Buttons and LEDs

The kit has two user push buttons, marked BTN0 and BTN1, that are connected to GPIOs on the SiWG917Y Module. The BTN0 is connected to "deep sleep" wake-up pin UULP_VBAT_GPIO_2 and BTN1 is connected to GPIO_11, respectively, and they are de-bounced by an RC filter with a time constant of 1 ms. The logic state of a button is high while that button is not being pressed, and low when it is pressed.

The kit also features two yellow LEDs, marked LED0 and LED1, that are controlled by GPIO pins on the SiWG917Y Module. The LEDs are connected to pin GPIO_10 and ULP_GPIO_2, respectively, in an active-high configuration.

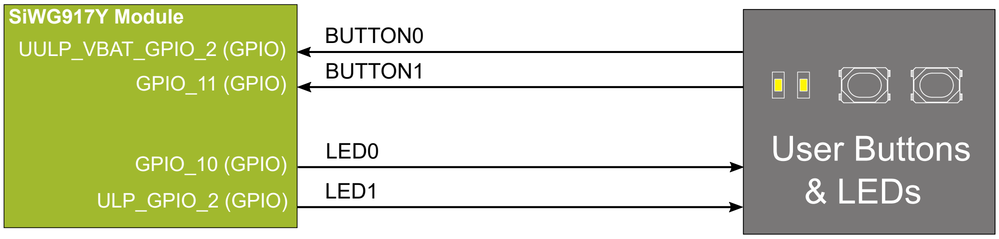


Figure 3.4. Buttons and LEDs

3.5 ISP Mode Button

The kit features an ISP button for In System Programming, which helps to load firmware to the SiWG917Y Module. ISP mode can be used to reprogram the flash, if the application codes uses JTAG pins for other multiplexed functionalities. On boot up, if the application code goes into a state where JTAG interface is not functioning, ISP mode can be used to gain the control and to reprogram the flash.

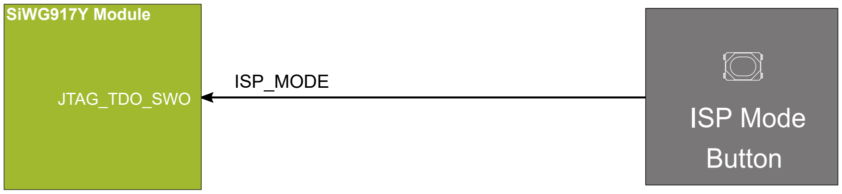


Figure 3.5. ISP Mode Button

3.6 External Memory

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit includes a 64 Mbit QSPI PSRAM that is isolated from the SiWG917Y Module using switch. The APS6404L-3SQR-ZR device features a high-speed, low-pin count interface. To keep current consumption down, it is important that the PSRAM is always put in power off mode when not used. Set power off mode by controlling the slide switch to turn off the supply to the 6 channel multiplexer. The multiplexer provides the I/O and power isolation to the PSRAM. The figure below shows how the QSPI PSRAM is connected to the SiWG917Y Module.

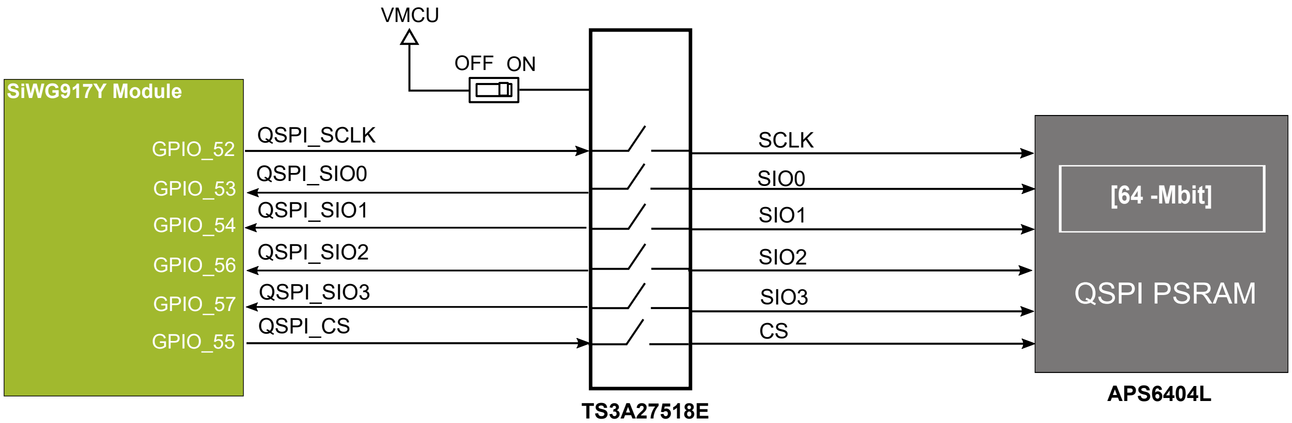


Figure 3.6. QSPI PSRAM

3.7 On-board Debugger

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit contains a separate microcontroller that provides the user with an on-board J-Link debugger through the USB Type-C port. This microcontroller is referred to as the "on-board debugger", and is not programmable by the user. When the USB cable is removed, the on-board debugger goes into a very low power shutoff mode (EM4S), consuming around 80 nA typically (See EFM32GG12 data sheet).

In addition to providing code download and debug features, the on-board debugger also presents a virtual COM port for general purpose application serial data transfer.

The figure below shows the connections between the target SiWG917Y Module and the on-board debugger.

Refer to section 4. Debugging for more details on debugging.

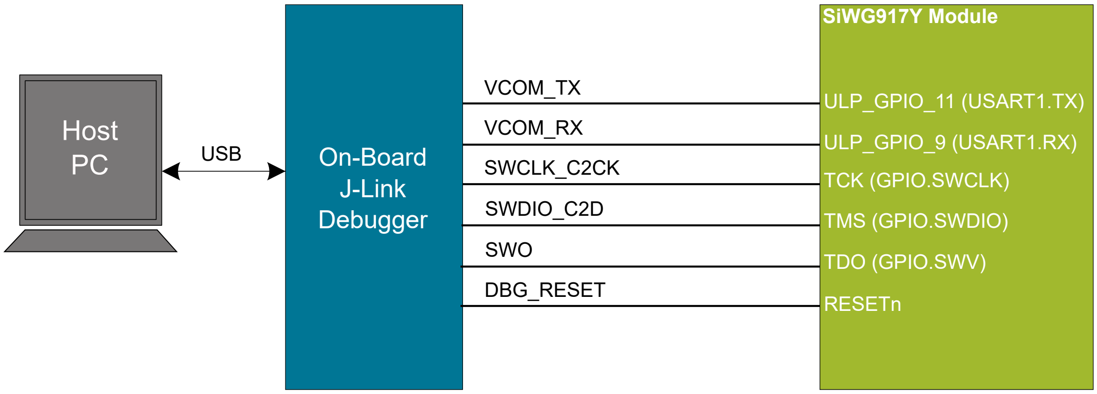


Figure 3.7. On-Board Debugger Connections

3.8 Connectors

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit features a USB Type-C connector, 20 breakout pads, a mikroBUS connector for connecting mikroBUS add-on boards, and a Qwiic connector for connecting Qwiic Connect System hardware. The connectors are placed on the top side of the board, and their placement and pinout are shown in the figure below. For additional information on the connectors, see the following sub chapters.

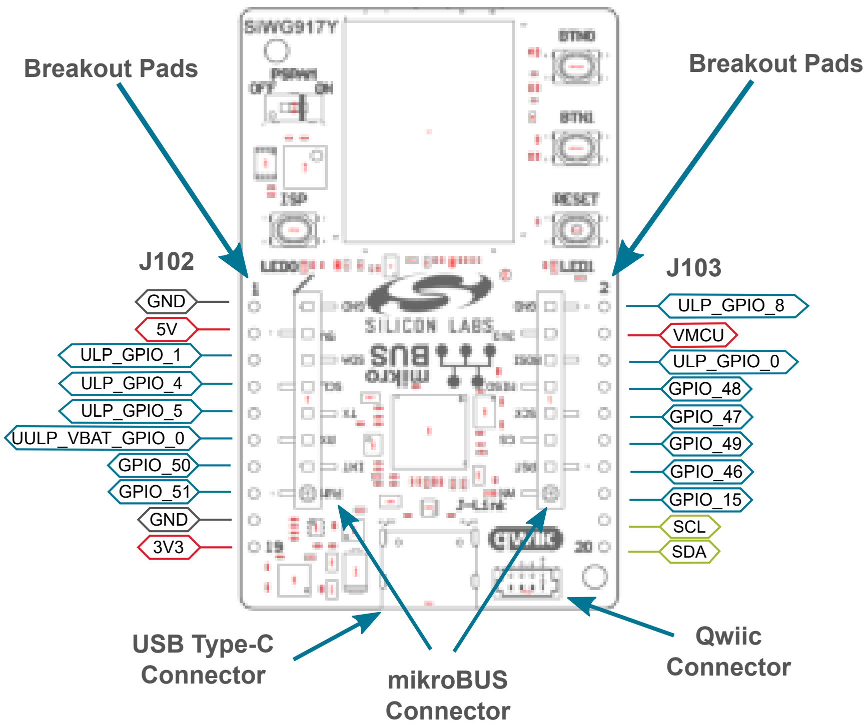


Figure 3.8. SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit Connectors

3.8.1 Breakout Pads

Twenty breakout connections are provided and allow connection of external peripherals. There are 10 connections on the left side of the board, and 10 connections on the right. The breakout pads contain a number of I/O pins that can be used with most of the SiWG917Y Module's features. Additionally, the VMCU (main board power rail), 3V3 (LDO regulator output), and 5V power rails are also exposed on the pads.

The pin-routing on the module is very flexible, so most peripherals can be routed to any pin. However, pins may be shared between the breakout pads and other functions on the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit. The table below includes an overview of the breakout pads and functionality that is shared with the kit.

Table 3.2. Breakout Pads Pinout

Pin	Connection	Shared Feature
Left-side Breakout Pins		
1	GND	Ground
3	5V	Board USB voltage
5	ULP_GPIO_1	GPIO
7	ULP_GPIO_4	GPIO
9	ULP_GPIO_5	GPIO
11	ULP_VBAT_GPIO_0	GPIO
13	GPIO_50	GPIO
15	GPIO_51	GPIO
17	GND	Ground
19	3V3	Board controller supply
Right-side Breakout Pins		
2	ULP_GPIO_8	GPIO
4	VMCU	SiWG917Y voltage domain
6	ULP_GPIO_0	GPIO
8	GPIO_48	GPIO
10	GPIO_47	GPIO
12	GPIO_49	GPIO
14	GPIO_46	GPIO
16	GPIO_15	GPIO
18	BOARD_ID_SCL	Connected to Board Controller for identification of add-on boards.
20	BOARD_ID_SDA	Connected to Board Controller for identification of add-on boards.

3.8.2 MikroBUS Socket

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit features a mikroBUS socket compatible with mikroBUS add-on boards. MikroBUS add-on boards can expand the functionality of the kit with peripherals such as sensors, displays, communication modules, power management, memory and storage, etc. Add-on boards follow the mikroBUS socket pin mapping and communicate with the on-kit module through UART, SPI or I^{2}C. Several GPIOs are exposed on the mikroBUS socket. MikroBUS add-on boards can be powered by the 5V or VMCU power rails, which are available on the mikroBUS socket.

The module pinout on the kit ensures that all required peripherals are available on the mikroBUS socket. The I^{2}C signals are, however, shared with the Qwiic connector.

When inserting a mikroBUS add-on board, refer to the orientation notch on the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit, shown in the figure below, to ensure correct orientation. Add-on boards have a similar notch that needs to be lined up with the one shown below.

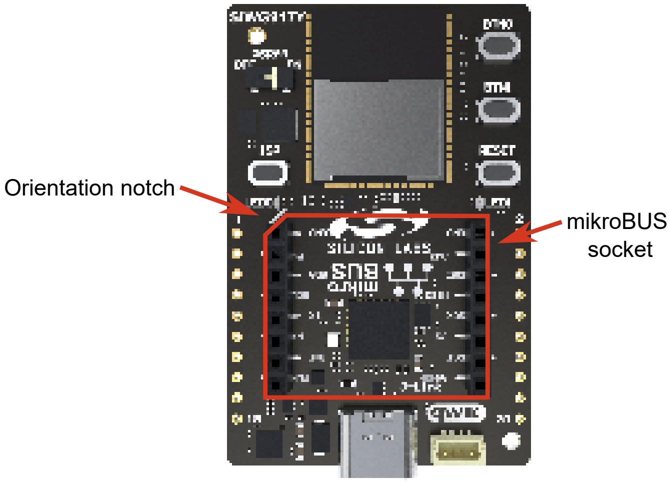


Figure 3.9. mikroBUS Add-on Board Orientation

The table below gives an overview of the mikroBUS socket pin connections to the SiWG917Y.

Table 3.3. mikroBUS Socket Pinout

MikroBUS Pin Name	MikroBUS Pin Function	Connection	Shared Feature
AN	Analog	GPIO_29	–
RST	Reset	GPIO_30	–
CS	SPI Chip Select	GPIO_28	–
SCK	SPI Clock	GPIO_25	–
MISO	SPI Main Input Secondary Output	GPIO_26	–
MOSI	SPI Main Output Secondary Input	GPIO_27	–
PWM	PWM Output	GPIO_12	–
INT	Hardware Interrupt	UULP_VBAT_GPIO_2	–
RX	UART Receive	ULP_GPIO_6	–
TX	UART Transmit	ULP_GPIO_7	–
SCL	I2C Clock	GPIO_7	QWIIC_I2C_SCL
SDA	I2C Data	GPIO_6	QWIIC_I2C_SDA
3V3	VCC 3.3V power	VMCU	SiWG917Y voltage domain

MikroBUS Pin Name	MikroBUS Pin Function	Connection	Shared Feature
5V	VCC 5V power	5V	Board USB voltage
GND	Reference Ground	GND	Ground

3.8.3 Qwiic Connector

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit features a Qwiic connector compatible with Qwiic Connect System hardware. The Qwiic connector provides an easy way to expand the functionality of the SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit with sensors, LCDs, and other peripherals over the I^2C interface. The Qwiic connector is a 4-pin polarized JST connector, which ensures the cable is inserted the right way.

Qwiic Connect System hardware is daisy chain-able as long as each I^2C device in the chain has a unique I^2C address.

Note: The Qwiic I^2C lines are shared with the on-board I^2C sensors.

The Qwiic connector and its connections to Qwiic cables and the SiWG917Y are illustrated in the figure below.

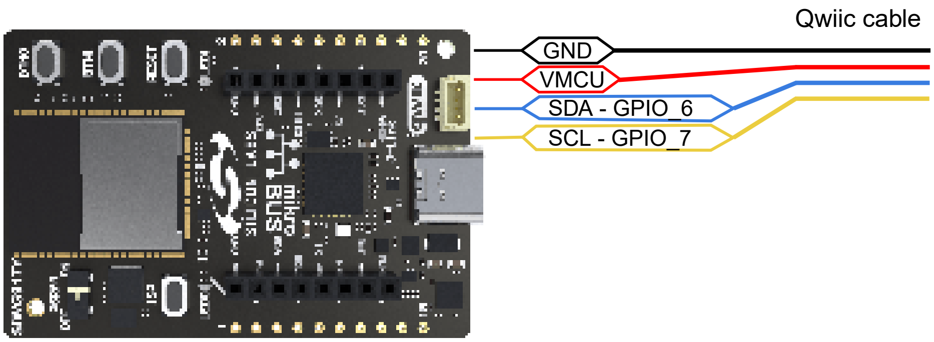


Figure 3.10. Qwiic Connector

The table below gives an overview of the Qwiic connections to the SiWG917Y.

Table 3.4. Qwiic Connector Pinout

Qwiic Pin	Connection	Shared Feature	Suggested Peripherial Mapping
Ground	GND	Ground	
3.3V	VMCU	SiWG917Y voltage domain	
SDA	GPIO_6	MIKROE_I2C_SDA	I2Cx.SDA
SCL	GPIO_7	MIKROE_I2C_SCL	I2Cx.SCL

3.8.4 Debug USB Type-C Connector

The debug USB port can be used for uploading code, debugging, and as a Virtual COM port. More information is available in section 4. Debugging.

4. Debugging

The SiWx917Y Module Wi-Fi 6 and Bluetooth LE Explorer Kit contains an on-board SEGGER J-Link Debugger that interfaces to the target module using the Serial Wire Debug (SWD) interface. The debugger allows the user to download code and debug applications running in the target SiWG917. Additionally, it provides a virtual COM port (VCOM) to the host computer that is connected to the target device's serial port for general purpose communication between the running application and the host computer. The on-board debugger is accessible through the USB Type-C connector.

4.1 On-board Debugger

The on-board debugger is a SEGGER J-Link debugger running on an EFM32 Giant Gecko. The debugger is directly connected to the debug and VCOM pins of the target SiWG917.

When the debug USB cable is inserted, the on-board debugger is automatically activated and takes control of the debug and VCOM interfaces. This means that debug and communication will **not** work with an external debugger connected at the same time. The on-board LDO is also activated, providing power to the board.

4.2 Virtual COM Port

The virtual COM port is a connection to a UART of the target SiWG917 and allows serial data to be sent and received from the device. The on-board debugger presents this as a virtual COM port on the host computer that shows up when the USB cable is inserted.

Data is transferred between the host computer and the debugger through the USB connection, which emulates a serial port using the USB Communication Device Class (CDC). From the debugger, the data is passed on to the target device through a physical UART connection.

The serial format is 115200 bps, 8 bits, no parity, and 1 stop bit by default.

Note: Changing the baud rate for the COM port on the PC side does not influence the UART baud rate between the debugger and the target device.

5. Schematics, Assembly Drawings, and BOM

Schematics, assembly drawings, and Bill of Materials (BOM) are available through Simplicity Studio when the kit documentation package has been installed. They are also available from the kit page on the Silicon Labs website: silabs.com.

6. Kit Revision History and Errata

6.1 Revision History

The kit revision can be found printed on the box label of the kit, as outlined in the figure below. The kit revision history is summarized in the table below.

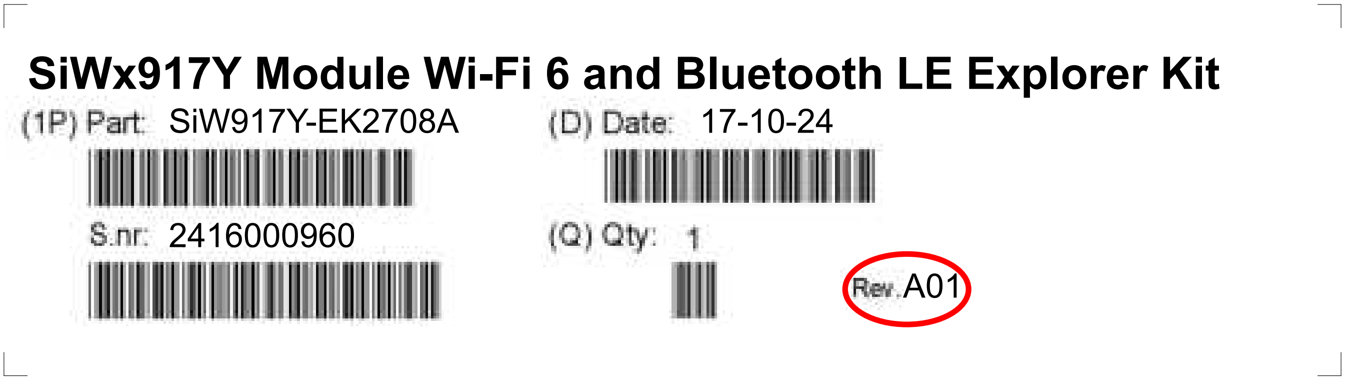


Figure 6.1. Revision Info

Table 6.1. Kit Revision History

Kit Revision	Released	Description
A01	17 October 2024	Kit revised due to BRD2708A upped to A03.
A00	29 August 2024	New kit introduction of SiWG917Y-EK2708A.

6.2 Errata

There are no known errata at present.

7. Board Revision History and Errata

7.1 Revision History

The board revision can be found laser printed on the board, and the board revision history is summarized in the following table.

Table 7.1. Board Revision History

Revision	Released	Description
A03	27 September 2024	Updated U1 Module OPN.
A02	19 July 2024	Updated U1 Module OPN.
A01	11 June 2024	Initial production release.

7.2 Errata

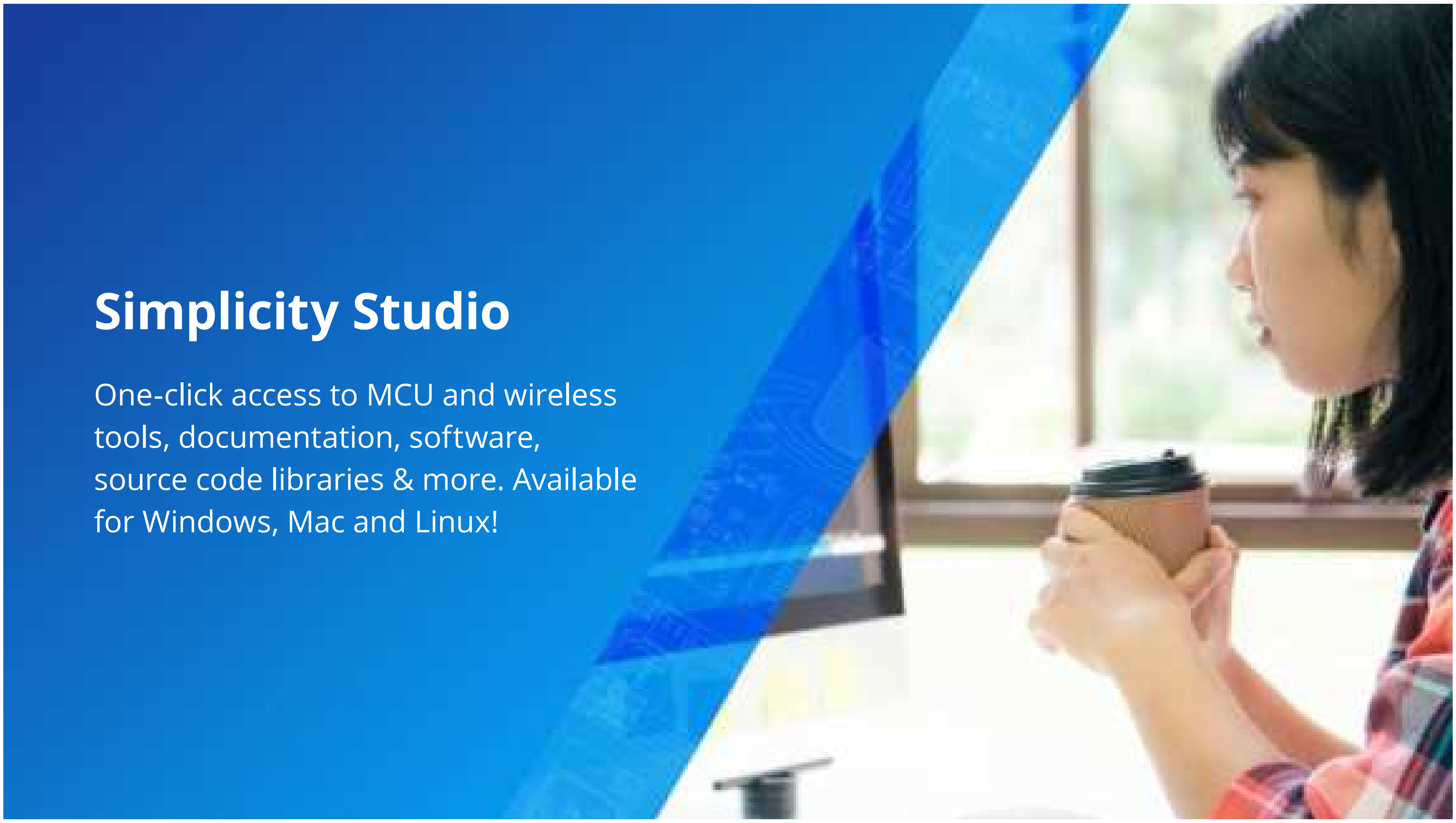
There are no known errata at present.

8. Document Revision History

Revision 1.0

October 2024

- Initial document release.



Simplicity Studio

One-click access to MCU and wireless tools, documentation, software, source code libraries & more. Available for Windows, Mac and Linux!

IoT Portfolio
www.silabs.com/IoT

SW/HW
www.silabs.com/simplicity

Quality
www.silabs.com/quality

Support & Community
www.silabs.com/community

SILICON LABS

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
USA

www.silabs.com