AW7698 EVK User Guide

Version: 1.2
Release date: 10 Dec 2019

Document revision history

Revision	Date	Description
1.0	1 June 2019	Initial release
1.1	20 Aug 2019	Update AW7698 EVK picture to main board [C649] with module [C614] and module adapter board [C648]
1.2	10 Dec 2019	Added instructions for entering an IAR, GCC or Keil MDK interface

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1. Introduction

1.1 Overview

Airoha IoT SDK for RTOS is a low-cost and easy to use Internet of Things (IoT) development platform to design, prototype, evaluate, and implement IoT projects. The platform supports the AW7698 evaluation kit (EVK). This user guide provides important information about the features of the EVK, including the pins, communication interfaces, core microcontroller unit (MCU) description, networking capabilities, and the methods for using them through the host driver.

The EVK includes the AW7698 chipset which is based on ARM Cortex-M4 with floating point unit in a BGA package. It enables rich connectivity features, communication with cloud services, and real-time control. The AW7698 EVK supports the ARM mbed IoT Device Platform for more convenient debugging and binary code download operations.

The following features are available with the EVK:

Mass storage device (MSD) programmer

- The AW7698 EVK has three binary files for bootloader, Wi-Fi connectivity, and FreeRTOS. The MSD programmer enables you to update the FreeRTOS binary file only.

Coresight Debug Access Port (CMSIS-DAP) debugging interface

- A firmware debugging interface similar to J-link. It enables debugging a target project or downloading a binary file to the flash storage of the device.

Virtual Serial Port

- Supports UART functionality, such as transferring log information from the EVK.

These features are used to download and debug a project on the AW7698 EVK.

The top view of the EVK, including a stamp module and main board, is shown in Figure 1.

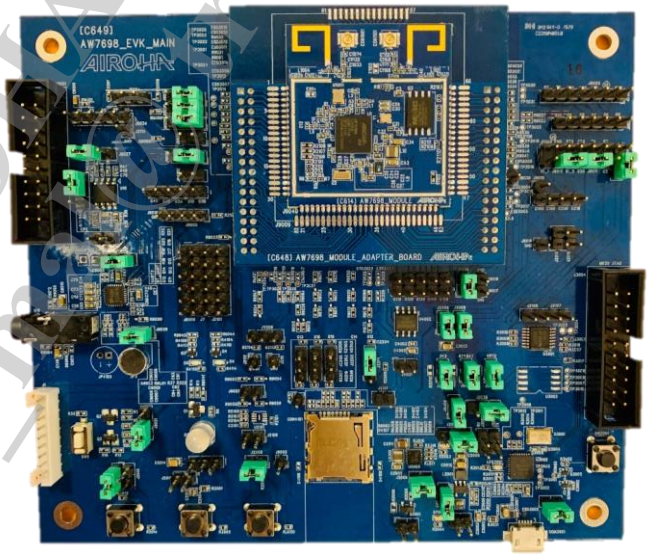


Figure 1. Top-view of the AW7698 EVK

2. Getting Started with the EVK

This section provides details on how to configure the EVK and install the peripheral drivers that are necessary for complete operation of the development platform.

Before starting any application development, you must set the main board jumpers as shown in Figure 2.

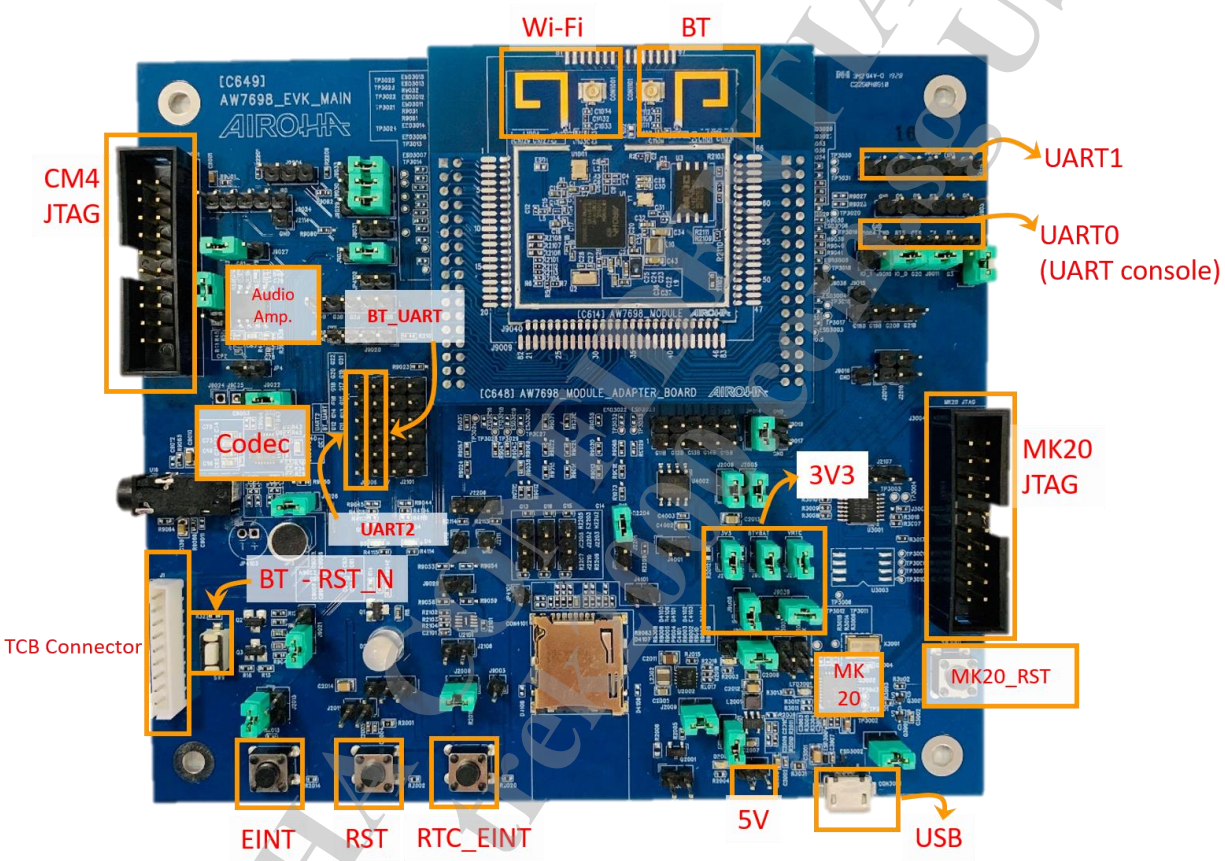


Figure 2. AW7698 EVK starting jumpers, buttons, and connectors

3. Hardware Description

This section provides information about the primary features of the AW7698 EVK. Please refer to the following sections for a detailed description of these features.

IEEE 802.11b/g/n Wireless Connectivity Single Chip with TFBGA package

The IOs on the AW7698 EVK are compatible with 3.3V. The IOs on the AW7698 chipset are compatible with 3.3V, 2.8V, and 1.8V.

Support for FreeRTOS

Flexible on-board power supply

- USB with power (V_{Bus}, 5V)
- External V_{IN} (1.8~3.63V)

Six LEDs

- Power LEDs (**D2001, D2002**)
- User LEDs (**D2**, **D4**, **D5**)
- UART communication LEDs (**LED3001**)

Five push buttons

- System reset
- Real time clock (RTC) interrupt
- External interrupt
- Bluetooth subsystem reset
- CMSIS-DAP firmware update button

XTAL (Crystal Oscillator)

- Wi-Fi 26MHz source clock support with low power consumption in idle mode.
- 32.768kHz clock for the RTC mode or external 32.768kHz mode.
- Bluetooth 32Mhz source clock.

USB re-enumeration capability. The same USB port supports two different interfaces:

- CMSIS-DAP USB
- Virtual COM port UART through USB on the PC

On-board PCB antenna with U.FL connector for testing

Micro-USB connector for power supply and debugging connections

Headers for measuring the current

4. Hardware Configuration

5.1 Microcontroller unit

The Cortex-M4 with floating-point computation unit (FPU) is a low-power processor with 3-stage pipeline Harvard architecture. It is an efficient, high-performance processor with a reduced pin count, low power consumption, and low interrupt latency, making it ideal for embedded microcontroller products.

Low power consumption is a significant feature for IoT and wearable devices. AW7698 uses a low power consumption embedded architecture which is optimized for many different types of applications in home automation, smart grids, handheld devices, personal medical devices, and industrial control devices that have lower data rates and transmit or receive data on an infrequent basis.

5.2 Power

The AW7698 EVK supports two types of 3.3V power supply. Figure 3 shows the schematic and power consumption measurement domain.

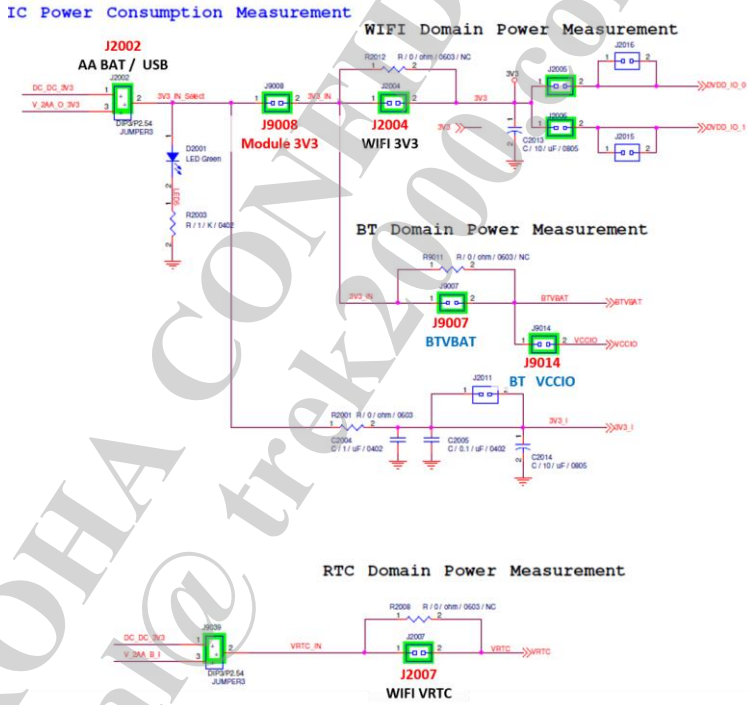


Figure 3. Power supply schematic

5.2.1 Using a micro-USB cable for the power supply

An on-board switching regulator provides a voltage of 3.3V for the AW7698 EVK if the power is supplied through the on-board micro-USB connector (**CON3001**) as shown in Figure 4. Note that the jumpers **J2002** pin 1 and pin 2, **J9008**, **J2004**, **J2007**, **J9007** must be set to on. Please refer to Table 1 for more information about the jumpers.

Table 1. Jumper settings for power supply from a micro-USB cable

Jumper	Usage	Comments
J2002 (1-2) **J9008** and **J9039 (1-2)**	3.3V power supply	Use the micro-USB connector as the 3.3V power source.
J2004	Wi-Fi domain power measurement	Measures the Wi-Fi current flow on AW7698.
J2007	RTC domain power measurement	Measures the current flow in Wi-Fi RTC mode on AW7698.
J9007	BT domain power measurement	Measures the BT current flow on AW7698.
J2005	Wi-Fi domain power measurement	Measures the current of DVDD_IO_0
J2006	Wi-Fi domain power measurement	Measures the current of DVDD_IO_1
J9014	BT domain power measurement	Measures the current of VCCIO

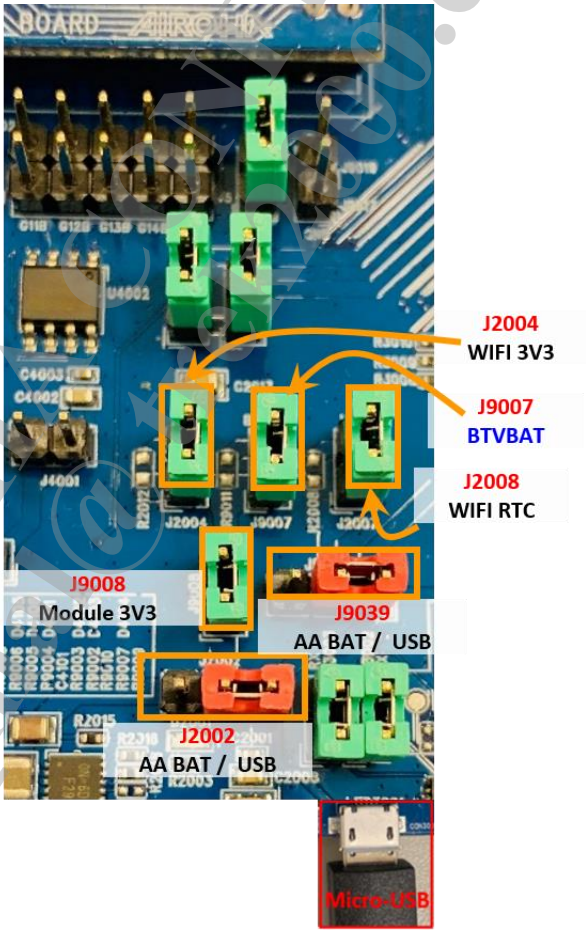


Figure 4. Micro-USB power supply and the related power measurement jumpers

5.2.2 Using two AA batteries for the power supply

Connect two AA batteries (ideally in a battery sled) to the battery pin header (**J2001**) to supply power to the system. The jumpers **J2002** pin 2 and pin 3, **J9039** pin 2 and pin 3, **J9008**, **J2004**, **J2007**, **J9007**, **J2009** must be set to on. Please refer to Table 2 for more information about the jumpers.

Table 2. Jumper settings for power measurement and power supply from two AA batteries

Jumper	Usage	Comments
J2001	Connection for the two AA batteries	**J2001(1)** connect to positive (**+**) **J2001(2)** connect to negative (**-**)
J2002 (2-3) **J9008** and **J9039 (2-3)**	3.3V power supply	Use two AA batteries as the source for the 3.3V power.
J2009	2xAA battery buck-boost	Connects AW7698 EXT_PWR_EN (pin J9) to the booster enabling pin
J2004	Wi-Fi domain power measurement	Measures the Wi-Fi current flow on AW7698
J2007	RTC domain power measurement	Measures the current flow in RTC mode on AW7698
J9007	BT domain power measurement	Measures the BT current flow on AW7698.
J2005	Wi-Fi domain power measurement	Measures the current of DVDD_IO_0
J2006	Wi-Fi domain power measurement	Measures the current of DVDD_IO_1
J9014	BT domain power measurement	Measures the current of VCCIO

5.3 Boot strapping

The AW7698 EVK has jumpers reserved for boot strapping, as shown in Figure 5, Figure 6, and Figure 7.

If GPIO12 is high during the boot up process, the system boots up in GPIO mode. If GPIO12 is low when booting up, the system boots up in download mode.

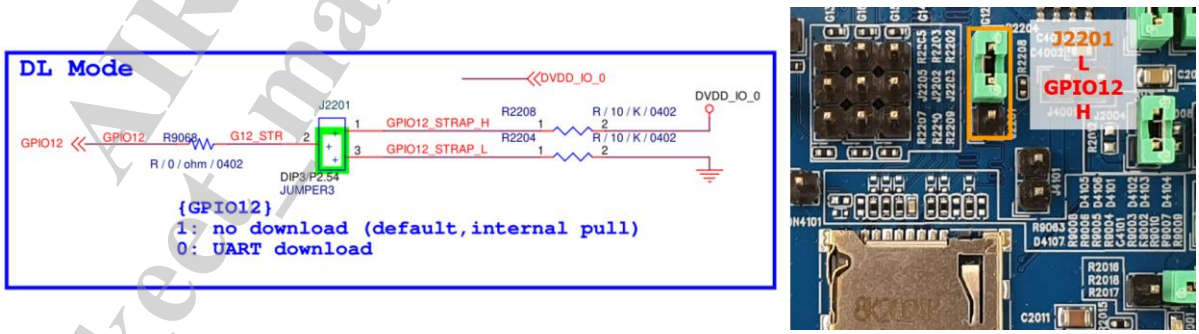


Figure 5. Wi-Fi download mode boot strapping

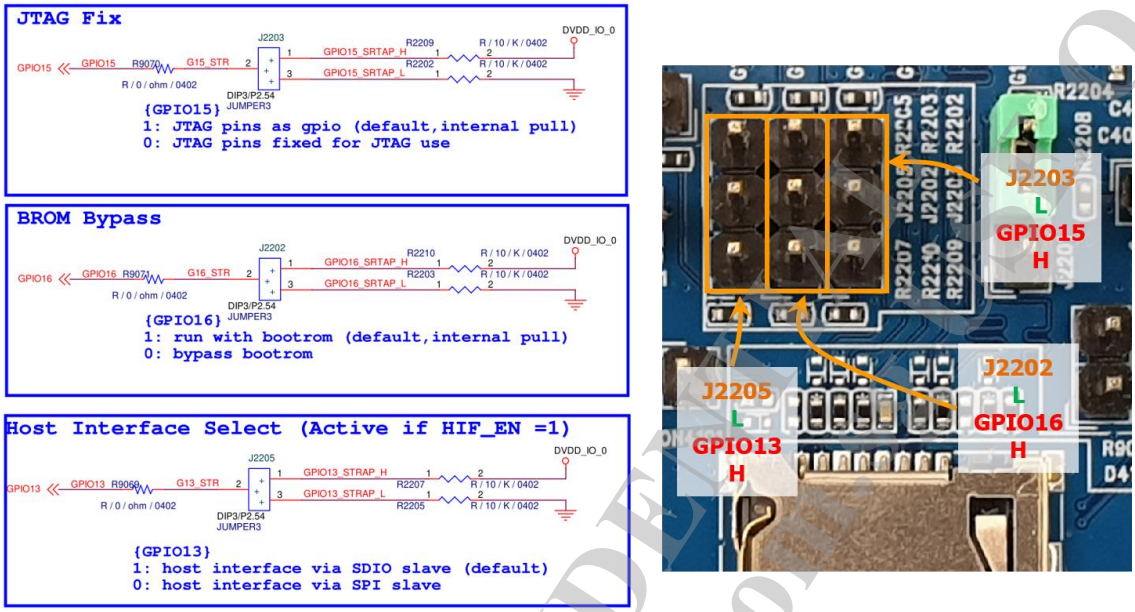


Figure 6. Boot strapping jumpers

Figure 7. BT strapping pin

5.4 RF connections

RF signals on AW7698 are routed to an on-board U.FL, a conductive test component by default, and an I-PEX connector enables testing the signals using a compatible cable. If you want to perform the Wi-Fi and Bluetooth air testing to the on-board circuit antenna, you must remove the capacitor from **C1031** and solder it in position at **C1030**, and remove the capacitor from **C1108** and solder it in position at **C1106**.

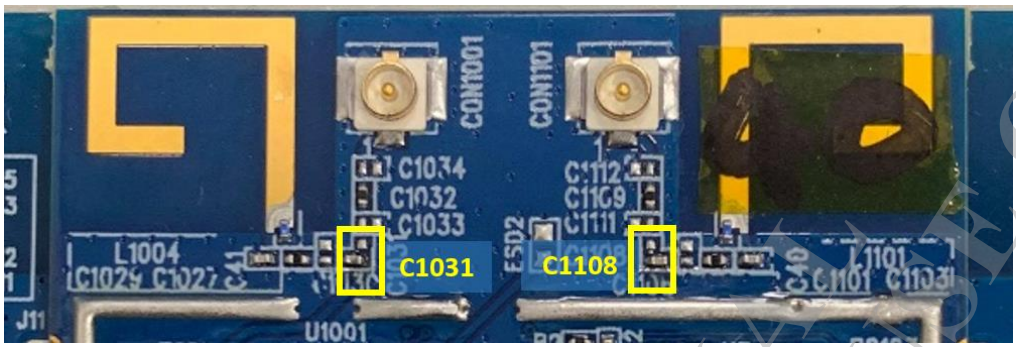


Figure 8. Location of C1031 and C1108

Figure 9. Location of C1030 and C1106

5.5 Codec/Audio amplifier

Change the jumpers and resistance from the default settings (as shown in Figure 10) to the settings shown in Table 3. Figure 11 shows the codec jumper settings.

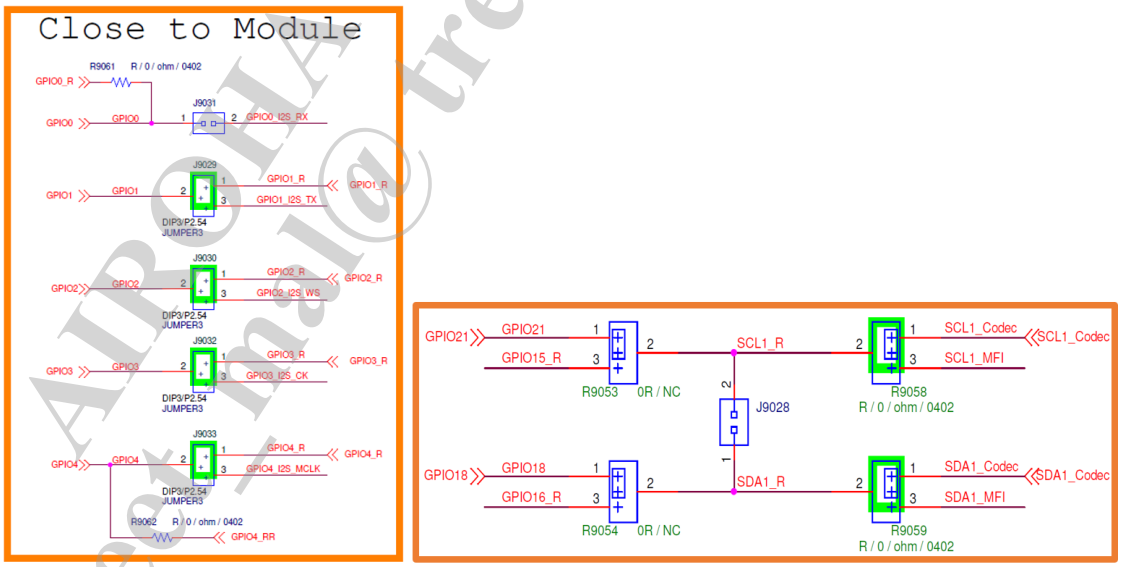
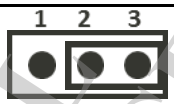
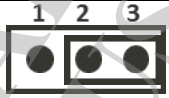
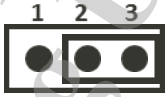
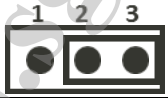


Figure 10. AW7698 EVK default jumper settings

Table 3. Settings for enabling codec jumpers and setting the resistance

Jumper/Resistance	Feature
J9031	GPIO0_I2S_RX Connect pin 1, 2
J9029	GPIO1_I2S_TX Connect pin 2, 3 
J9030	GPIO2_I2S_WS Connect pin 2, 3 
J9032	GPIO3_I2S_CK Connect pin 2, 3 
J9033	GPIO4_I2S_MLCK Connect pin 2, 3 
J9026	Power of Codec/Audio amplifier Connect pin 1, 2
R9053	Mount **R9053** at pin 1, 2
R9054	Mount **R9054** at pin 1, 2

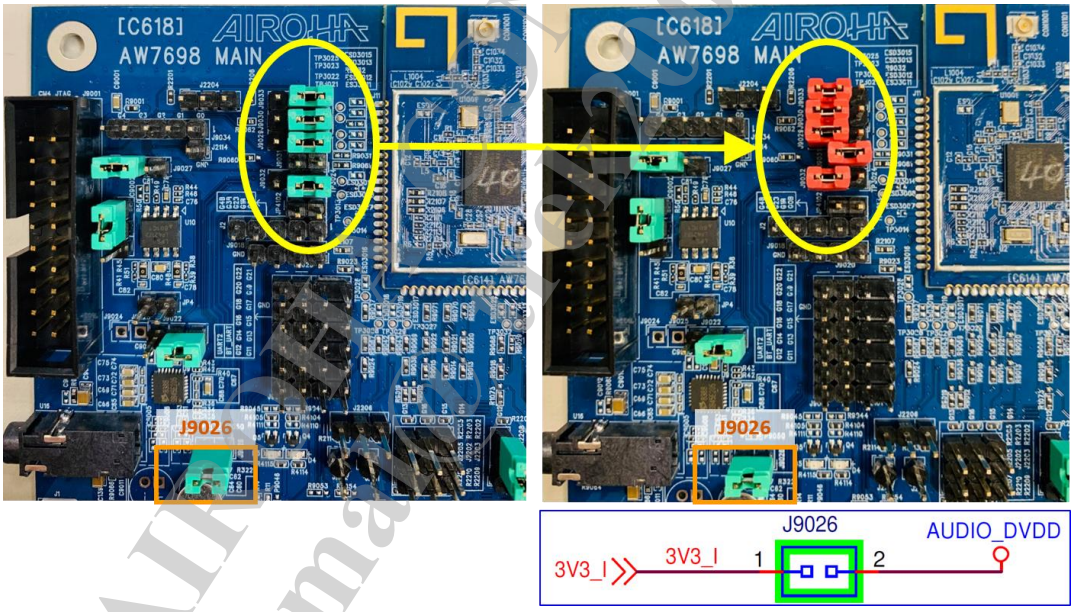


Figure 11. Jumper setup to enable the codec setting

5.6 LEDs

The different LEDs on the AW7698 EVK are related to specific functions. Figure 12 shows the locations of the LEDs.

D2 is a 3-colour RGB LED. The schematic for the LEDs controlled by AW7698 is shown in Figure 13.

D2002 indicates the 5V power rail is on.

D2001 indicates the 3.3V power rail is on.

LED3001 indicates that there is active communication between MK20 UART and AW7698 UART0.

D2 indicates open-drain GPIOs (i.e. OD_GPIO0_B, OD_GPIO1_B and OD_GPIO2_B).

D4 and **D5** are LEDs assigned for user interaction. All LEDs are high active.

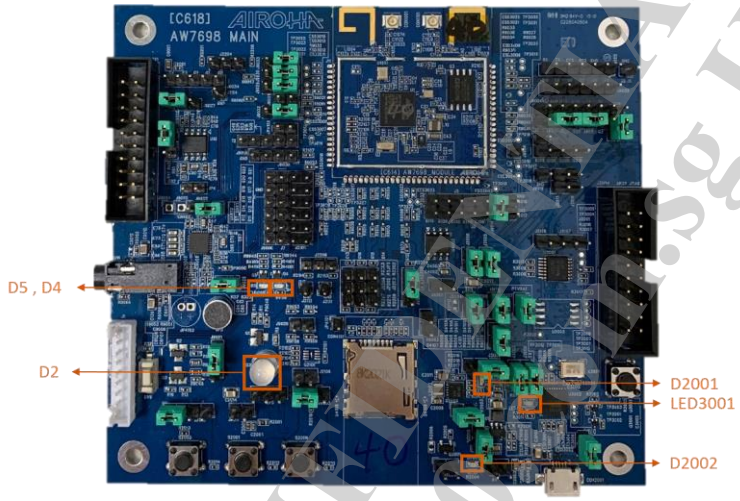


Figure 12. Onboard LEDs

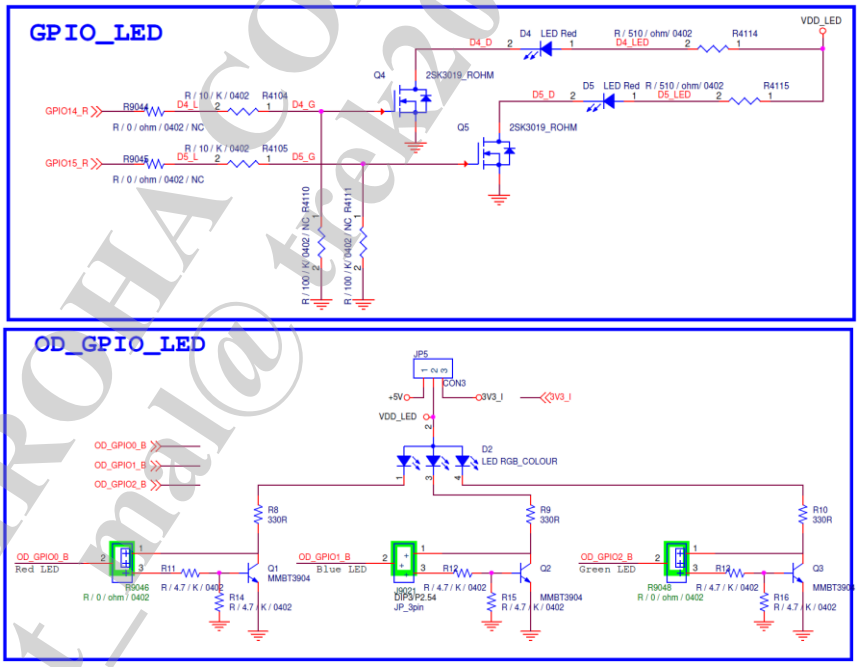


Figure 13. AW7698 LED schematic

5.7 Buttons

There are five push buttons on the EVK main board as shown in Figure 14. The buttons on the AW7698 EVK have the following functionality:

1) System reset button (**S2001**) resets the AW7698 EVK.

2) External interrupt button (**S2005**). You can configure GPIO0 as an external interrupt pin. Press the button to wake up the system from the sleep mode.

3) RTC interrupt button (**S2006**). When the system is in RTC mode, push this button to wake up the system.

4) CMSIS-DAP firmware update button (**SW3001**). Press this button to go into upload mode and upload the latest CMSIS-DAP Firmware to MK20.

5) Bluetooth reset button (**SW9**) resets the BT subsystem.

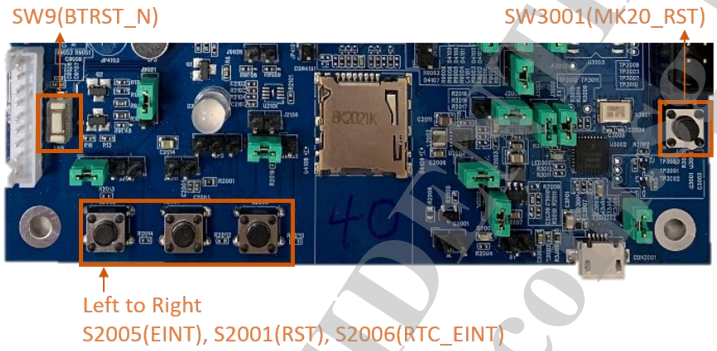


Figure 14. Key buttons on the EVK main board

5.8 GPIO/Extension connectors

The AW7698 EVK provides similar pin-out extension connectors (i.e. **J2101**, **J9034, J9035, J2, J3, J4, J5**) for various sensor and device connectivity, as shown in Figure 15 and described in Table 4.

You can configure the functionality of each I/O, depending on the use case.

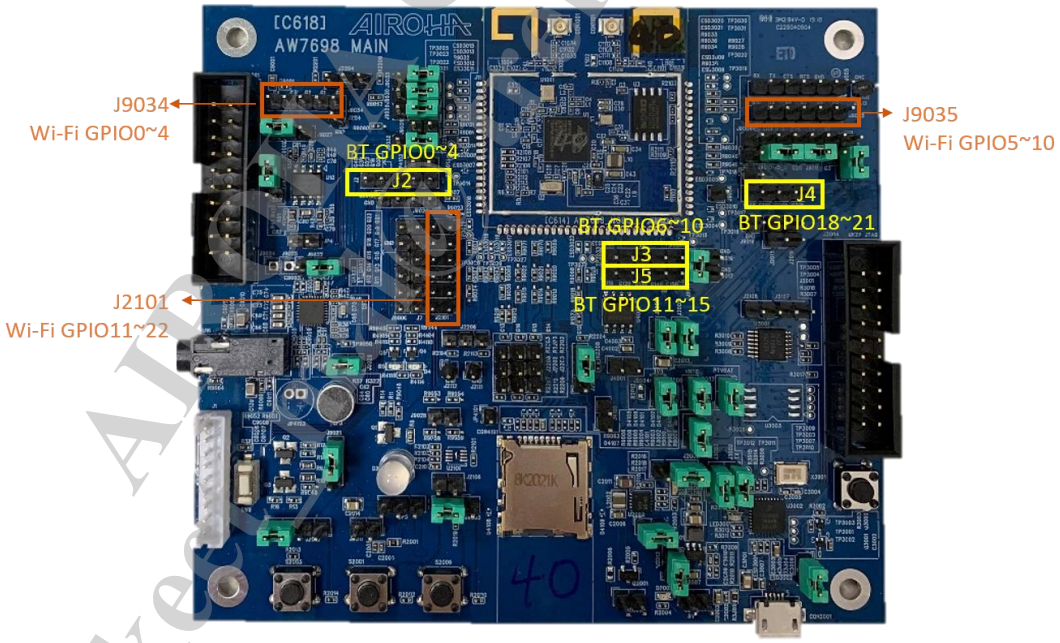


Figure 15. Wi-Fi and BT GPIOs

Table 4. GPIO pin-out extension connectors

Connector Pin Number	Signal Name	Connector Pin Number	Signal Name
J2101.1	GPIO22	**J2.1**	GPIO0_B
J2101.2	GPIO21	**J2.2**	GPIO1_B
J2101.3	GPIO20	**J2.3**	GPIO2_B
J2101.4	GPIO19	**J2.4**	GPIO3_B
J2101.5	GPIO18	**J2.5**	GPIO4_B
J2101.6	GPIO17_R	**J3.1**	GPIO6_B
J2101.7	GPIO16_R	**J3.2**	GPIO7_B
J2101.8	GPIO15_R	**J3.3**	GPIO8_B
J2101.9	GPIO14_R	**J3.4**	GPIO9_B
J2101.10	GPIO13_RR	**J3.5**	GPIO10_B
J2101.11	GPIO12_R	**J5.1**	GPIO11_B
J2101.12	GPIO11_RR	**J5.2**	GPIO12_B
J9034.1	GPIO0_RR	**J5.3**	GPIO13_B
J9034.2	GPIO1_R	**J5.4**	GPIO14_B
J9034.3	GPIO2_R	**J5.5**	GPIO15_B
J9034.4	GPIO3_R	**J4.1**	GPIO18_B
J9034.5	GPIO4_R	**J4.2**	GPIO19_B_R
J9035.1	GPIO5	**J4.3**	GPIO20_B_R
J9035.2	GPIO6	**J4.4**	GPIO21_B_R
J9035.3	GPIO7_R		
J9035.4	GPIO8_R		
J9035.5	GPIO9_R		
J9035.6	GPIO10		

5.9 Micro SD card holder

Please refer to Table 5 when you want to enable the SD card holder. You must also use two Dupont lines to allow UART1 to connect to BT_UART (GPIO5 connects to BT_UART_TX and GPIO6 connects to BT_UART_RX) because enabling the SD card function uses GPIO11 to GPIO16, as shown in Figure 17.

Table 5. Actions for reworking the SD card holder

	Description
Mount	4 bit mode: Mount **R9063** 1 bit mode: Mount **R9063, R9008, R9009, R9010**

	Description
Rework	Rework **R9018, R9019, R9020, R9021, R9022, R9024, R9060** from pin 1, 2 to pin 2, 3
Remove	Remove **R5, R2112**, and **R2113** from the AW7698 module
Jumper	Set **J4101** on
Download	To download, set the jumper on **J2201** pin 2, 3 (UART download mode) After downloading, remove **J2201**
UART	Use two Dupont Lines to connect UART1 to BT_UART: Connect GPIO5 to BT_UART_TX (connect **J9005-6** to **J7-5**) Connect GPIO6 to BT_UART_RX (Connect **J9005-5** to **J7-6**)

Left to Right
JP4101 , R9063 , R9008 , R9010 , R9009 , J4101

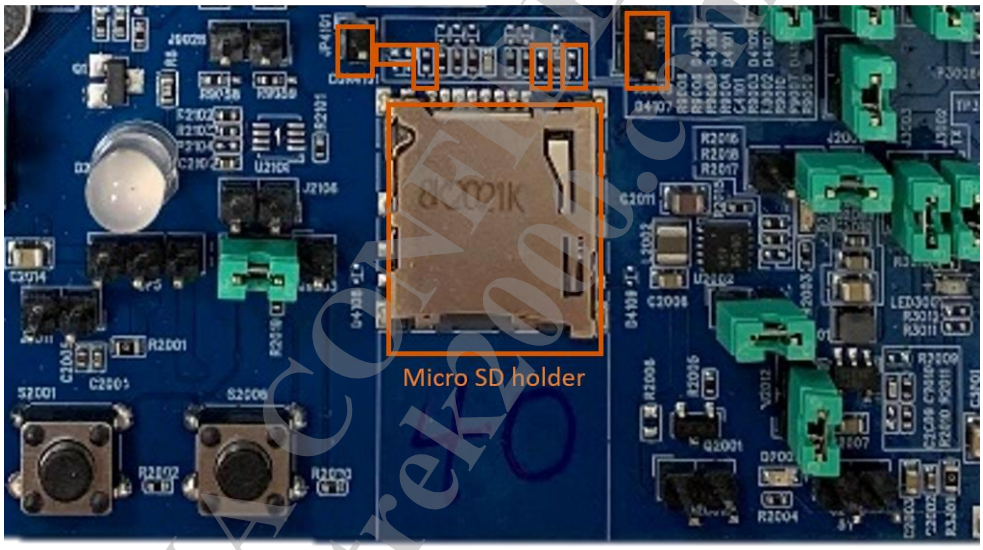


Figure 16. SD card holder and resistors

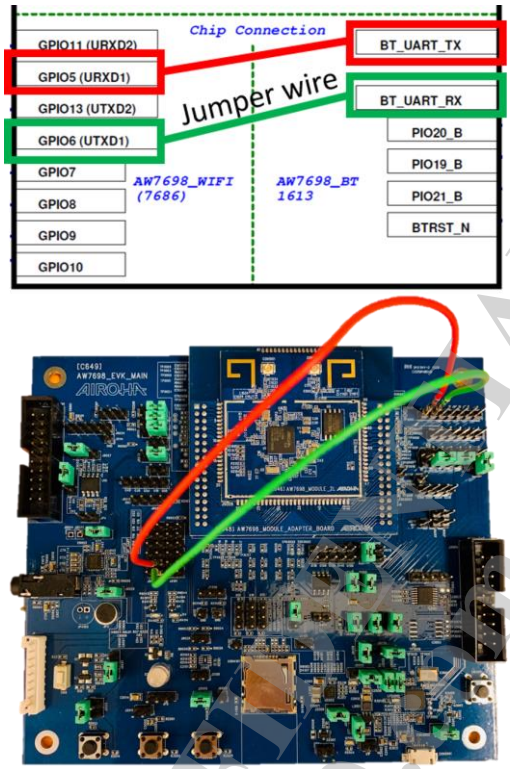


Figure 17. Jumper wire connecting UART1 and BT_UART

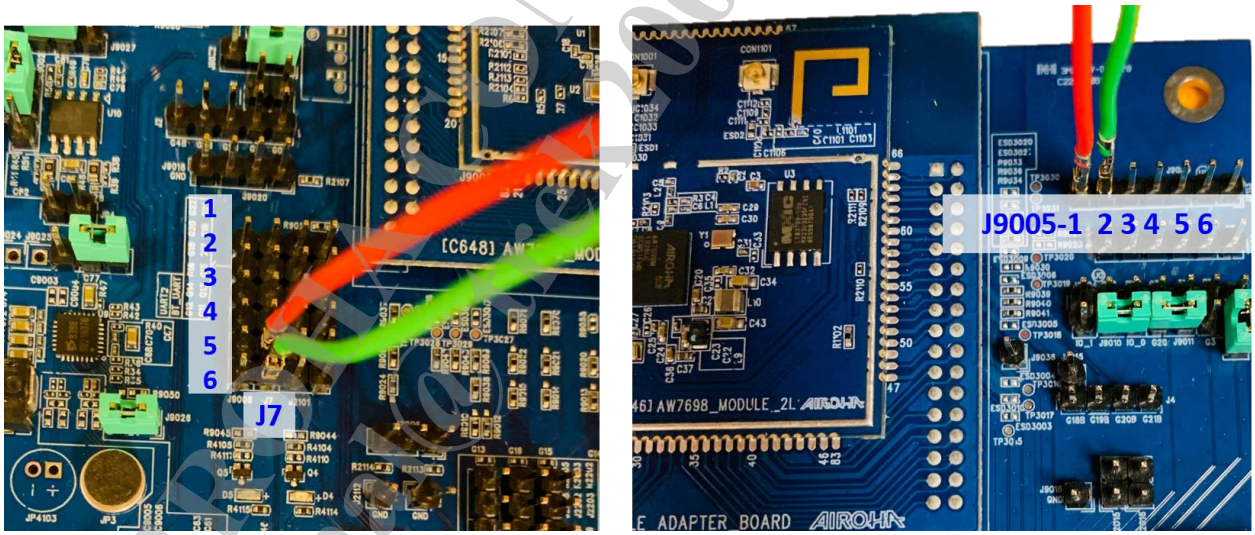


Figure 18. Detail connection of GPIO5 to BT_UART_TX (connect J9005-6 to J7-5)

and GPIO6 to BT_UART_RX (Connect J9005-5 to J7-6)

Figure 17 shows that rework Wi-Fi and BT coexistence from UART2 to UART1. J9035-1 is connected to J7-5, and J9035-2 is connected to J7-6.

Figure 18 shows the pin definition in detail.

5.10 UART connectors

There are four sets of reserved UART connectors on the EVK. Figure 19 shows the UART connector schematics for the GPIO selection. The allocation of these jumpers and connectors is shown in Figure 20.

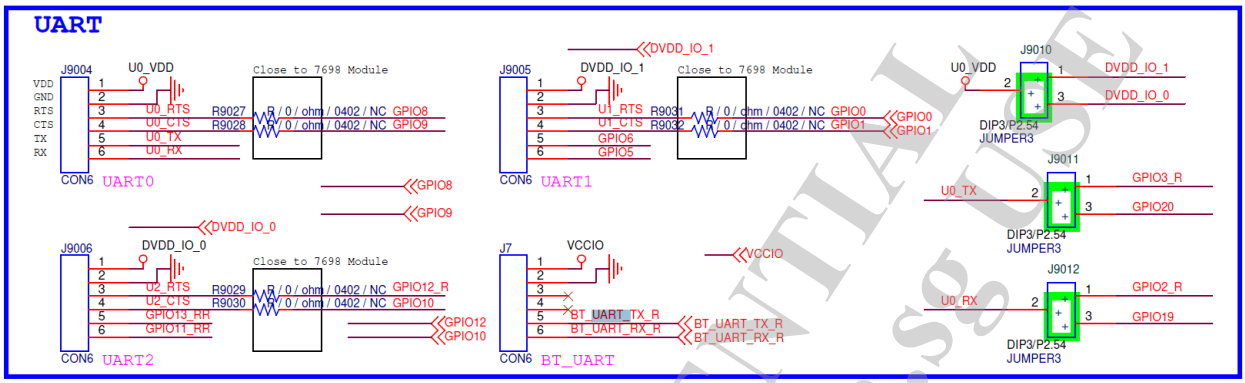


Figure 19. Four sets of UART schematics

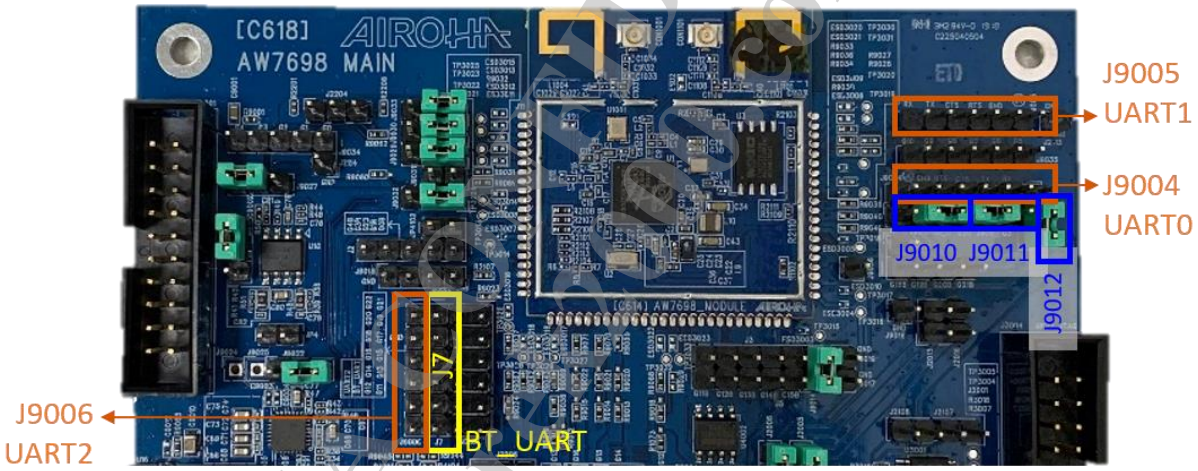


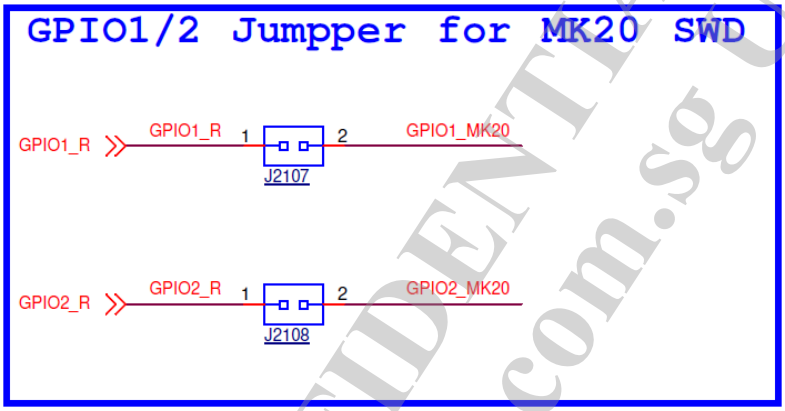
Figure 20. UART connectors and jumpers

5.11 Entering an IAR, GCC or Keil MDK development interface

AW7698 EVK supports the IAR, GCC, and Keil MDK development interfaces for designing and debugging.

Complete the following procedure to get access to these interfaces:

1) Set jumpers J2107 and J2108 to on.
2) Power up the board with a micro-USB cable to a computer.
3) Open the IAR, GCC or Keil MDK software on the computer.



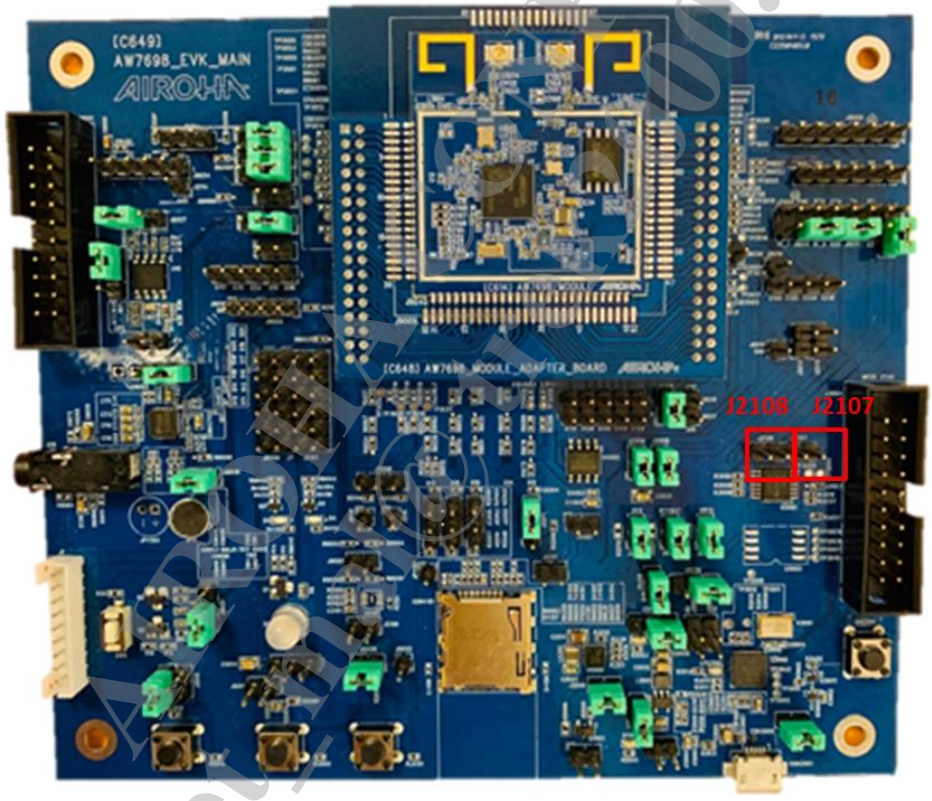


Figure 21. J2107 and J2108 jumpers for the IAR, GCC, or Keil MDK interface.