AB1565/AB1568 EVK Users Guide

Version: 1.1
Release date: 24 June 2022

Document revision history

Revision	Date	Description
1.0	29 May 2020	Initial Version. (C738/C742/C744)
1.1	24 June 2022	Add Table 6, Table 7 and Figure 3.2

Table of contents

Lists of tables and figures

1. Introduction

AB1565/8 is an advanced single-chip solution which integrates baseband and radio for intensive stereo/mono audio applications. Users can evaluate and configure each function of AB1565/8, including GPIO, LED, UART, SPI, I2C, and USB with the Evaluation Kit (EVK).

The EVK is a typical Bluetooth audio device which is designed for function evaluation and debugging. The user can configure each function and adjust parameters via the Airoha Configure Tool.

The EVK can also connect with the Airoha Test Control Board (TCB) to perform mass production calibration and functional tests with an MP Tool.

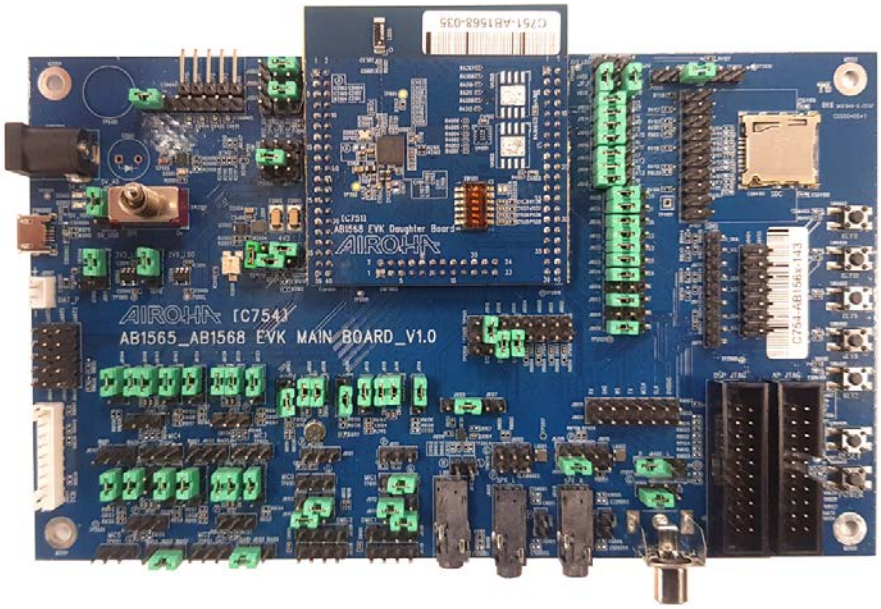


Figure 1.1 Top-view of EVK main board

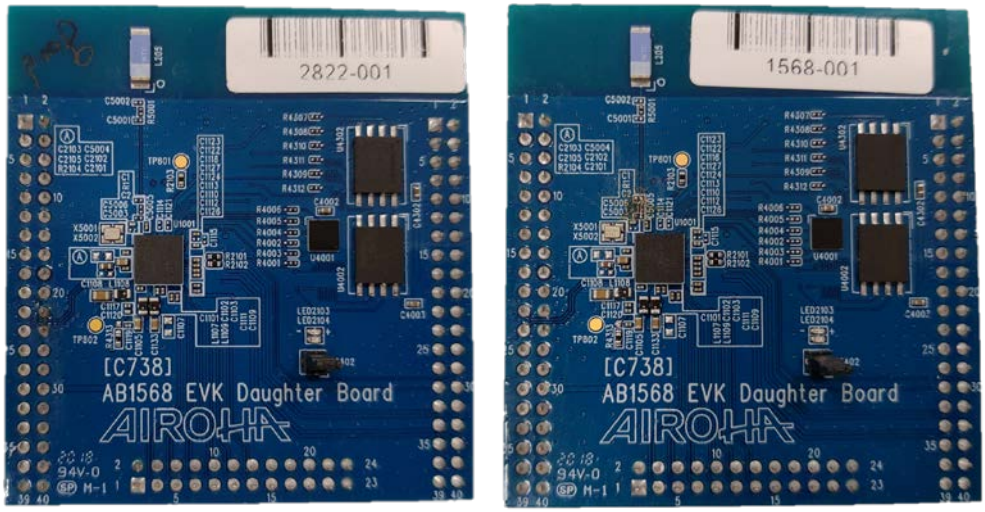


Figure 1.2 Top-view of EVK daughter board

2. Interface

The EVK provides designers with several IO and connector interfaces for evaluation. Figure 2.1 shows the top-view of the EVK board. The major components and interfaces are shown below the figure.

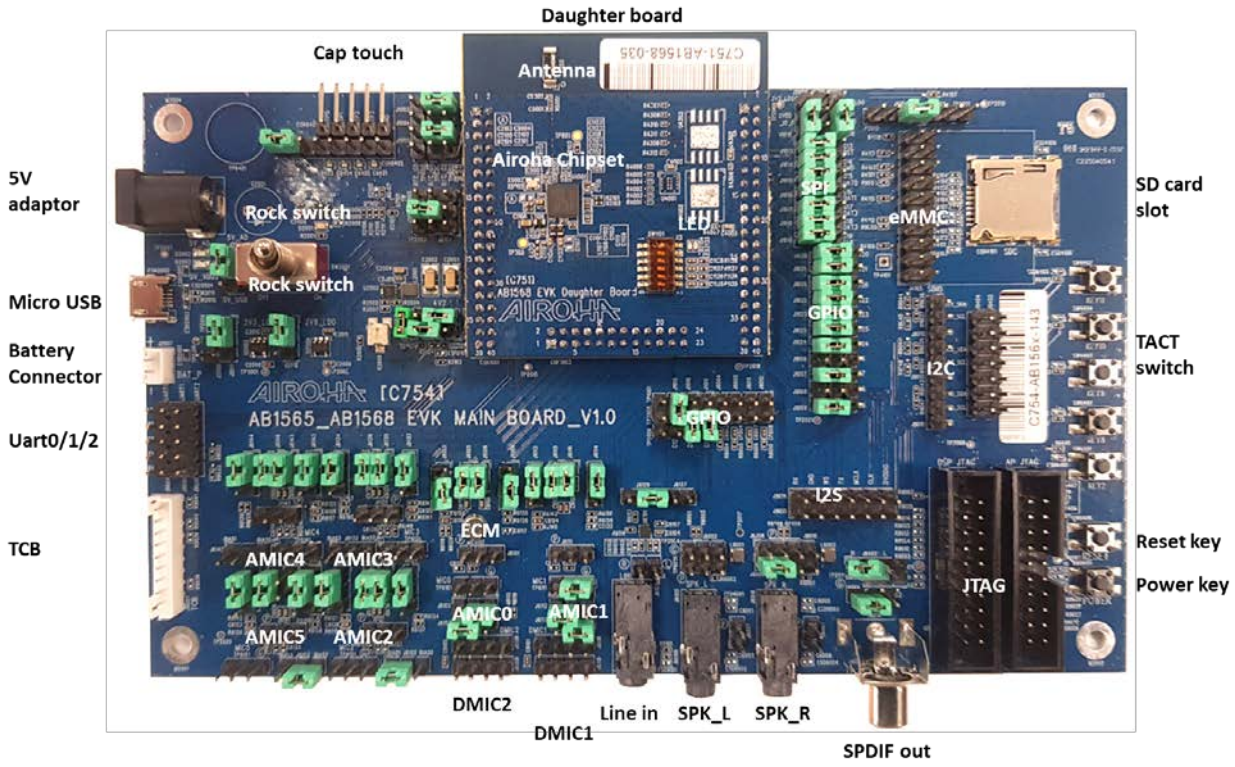


Figure 2.1 Interfaces of EVK

Main board

1) DC adapter - 5V DC Supply
2) Rock Switch – Switch DC Supply
3) Micro USB Connector – VBUS Supply
4) Battery Connector – Li-ion Battery
5) UART Connector – UART 0/1/2
6) TCB Connector – TCB (MP Tool) calibration
7) Microphone
8) Audio Jack – Speaker output
9) RCA Connector – SPDIF output
10) I2S interface
11) TACT Key Button – Power /Reset and GPIO
12) Micro SD slot – Micro SD card
13) Touch interface – Touch pad (C340)

Daughter board

1) Airoha Bluetooth Chipset
2) LED Indicator – Isink LED
3) Antenna – 2.4GHz chip antenna

3. System Block Diagram

Figure 3.1 shows a block diagram of the EVK. The Airoha chipset is the primary controller. It provides audio in/out in either analog or digital format, UART/I2C and SPI communication, an IO control, LED indication, etc.

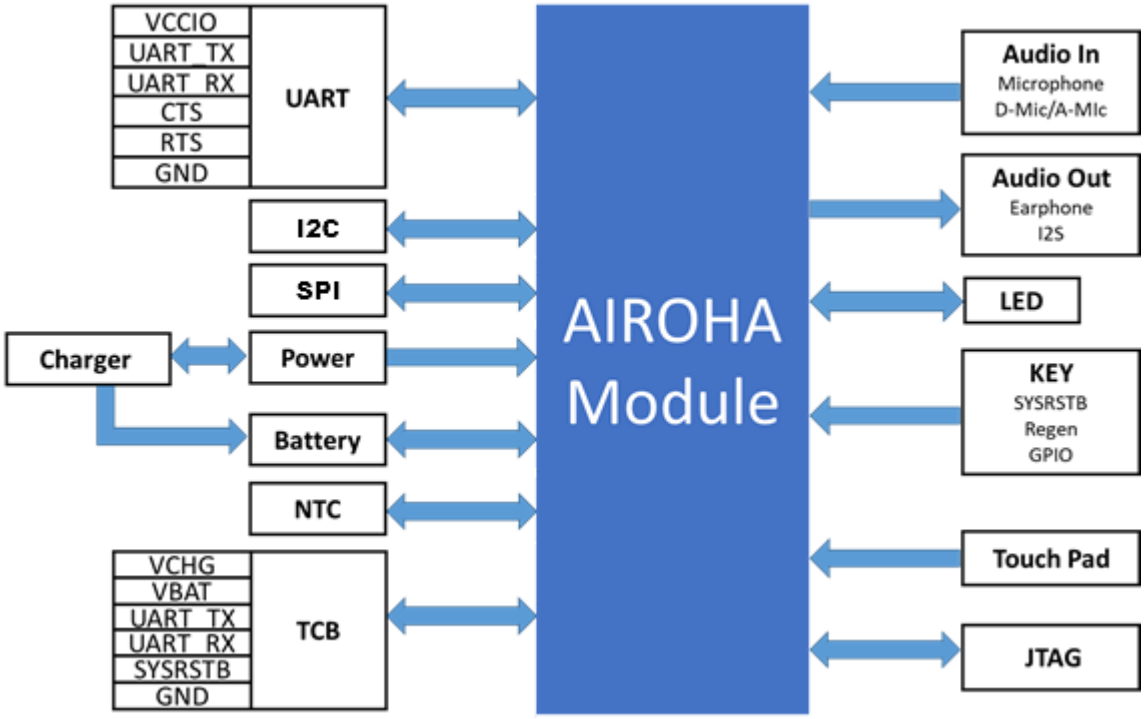


Figure 3.1 EVK Block diagram

If you have SDK's EVK firmware, keep the Default Jumper Setting as shown in Figure 3.2, then connect a DC 5V source to DC jack (CON2001), and press power key (on EVK bottom left). The EVK system will boot on normally.

Table 1. Main board jumper settings at the start of application development

Jumpers	Features/Purpose	Note
J2001	5V source	1-2 for DC adaptor input (Default) 2-3 for USB Vbus input
J2006	VBAT source	1-2 for Battery input 2-3 for external 4V2 Buck (Default)
J2002	Vbus source	1-2 for DC adaptor input via buck provide external 4V2 (Default) 2-3 for USB Vbus input
J6402	Power key	1-2 for 1565 power on, Regen connect to VSYS(Default) 2-3 for 1568 power on, pwrkey connect GND

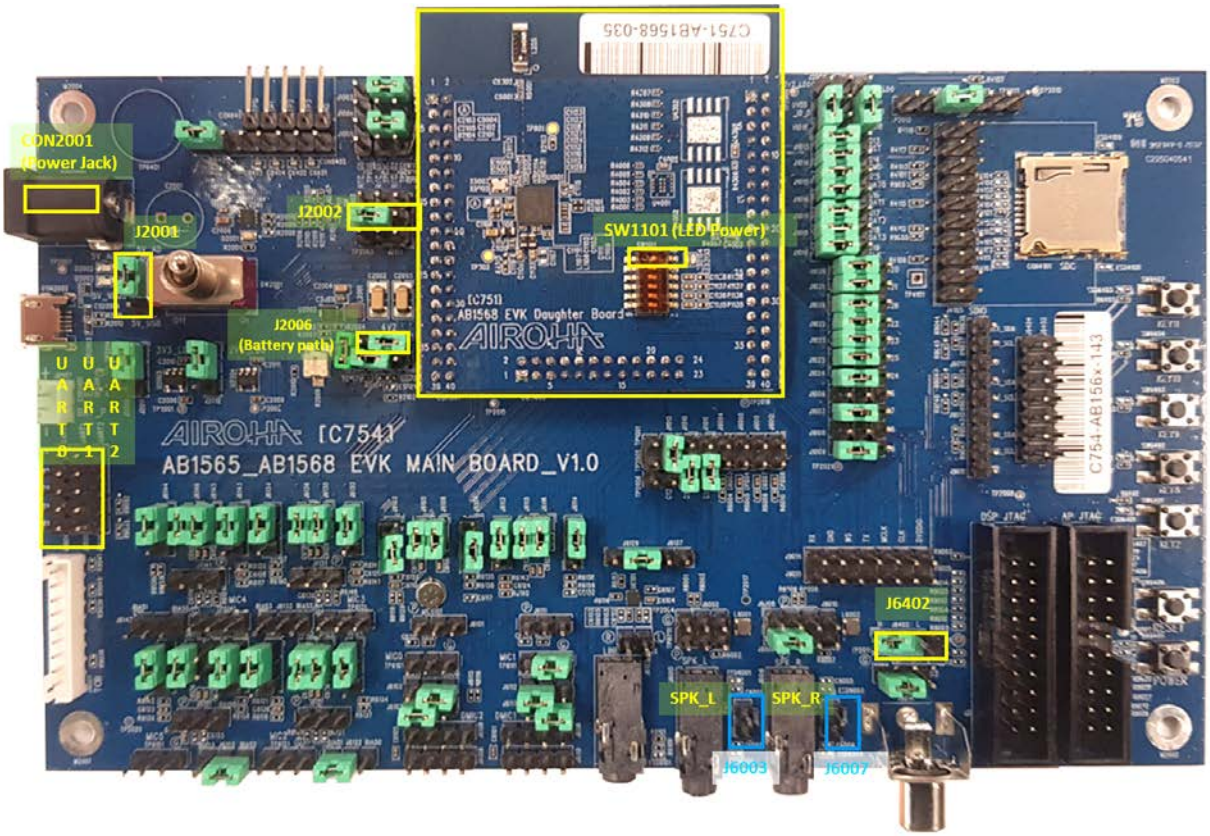


Figure 3.2 EVK Default Jumper Setting

4. Function Blocks

Function blocks of the EVK can be separated into three different function groups: Peripheral Connections; Control/Test points; and the audio interfaces. These function groups can be separated into more specific function blocks as shown in Figure 4.1. This document shows how to operate each function block.

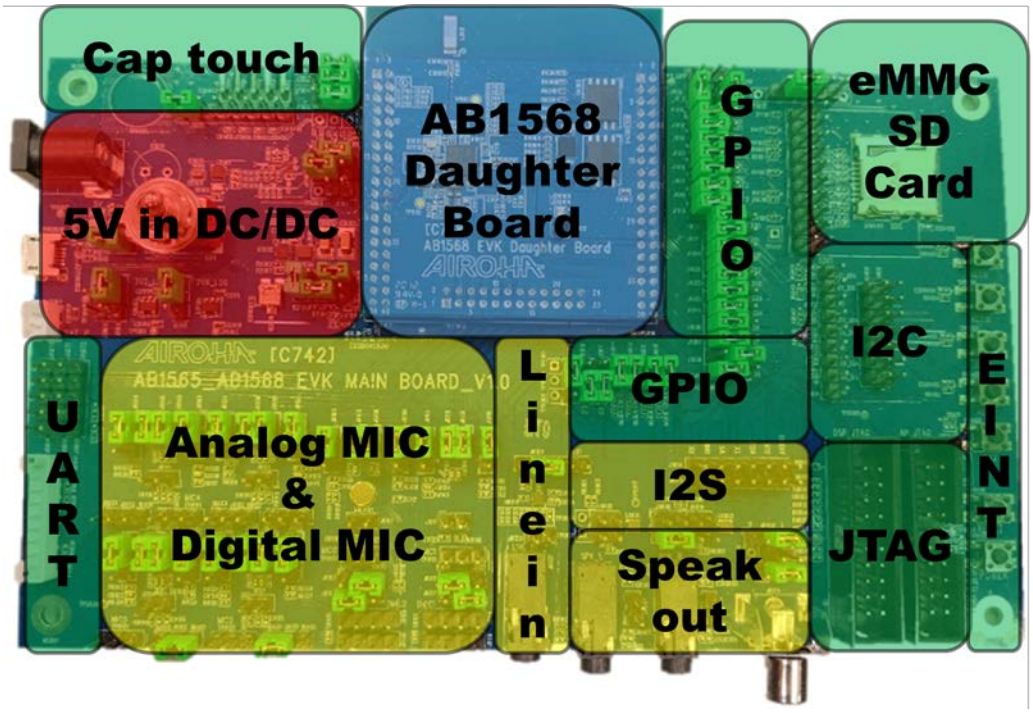


Figure 4.1 Function blocks of EVK

4.1 Peripheral Connections

4.1.1 Power Supply

There are two types of power supply for the EVK. The EVK can be powered in two ways: one way is via external DC power source converted to 4.2V, the source can be switched from DC jack or Micro USB by J2001; the second way is via a Li-ion battery with 4.2V.

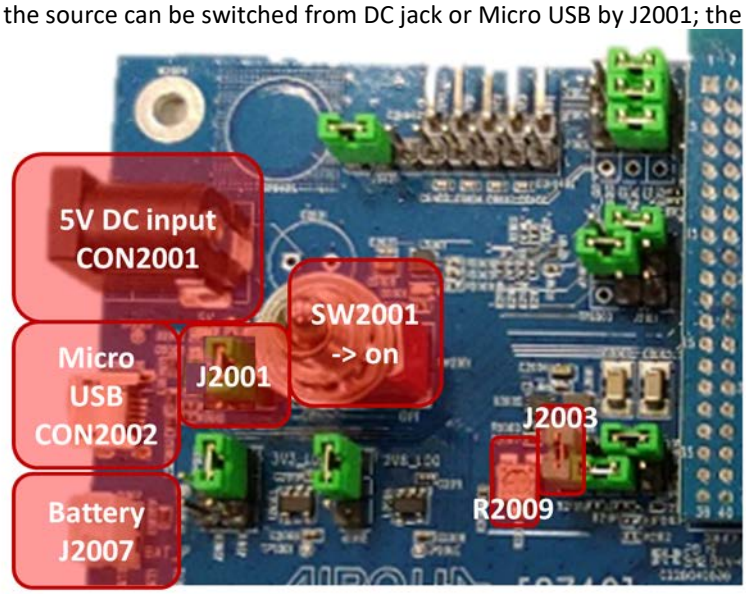
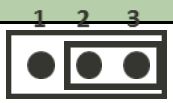
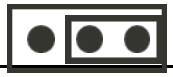


Figure 4.2 shows CON2001 is the connector for the 5V input, and SW2001 is the switch for DC 5V power supply. Alternatively, a Li-ion battery can be attached to J2007 to supply power. Users can refer to Table 2 to configure the corresponding power supply.

Table 2. Main board jumper power supply settings

Jumpers	Features/Purpose	Note
J2001	5V source	1-2 for DC adaptor input 2-3 for USB Vbus input 
J2006	VBAT source	1-2 for Battery input 2-3 for external 4V2 Buck 
SW2001	Switch DC input	Turn right to power on

4.1.2 BUCK Voltage Tuning

The AB1565/8 main board has an external BUCK voltage tuning design. Please refer to Figure 4.2 and follow the instructions for tuning the BUCK output voltage to simulate batteries with different voltages.

1) Plug in J2003 BUCK output will fix 4.2V
2) Remove J2003 and tune R2009; BUCK out will change between 2.8V to 4.2V

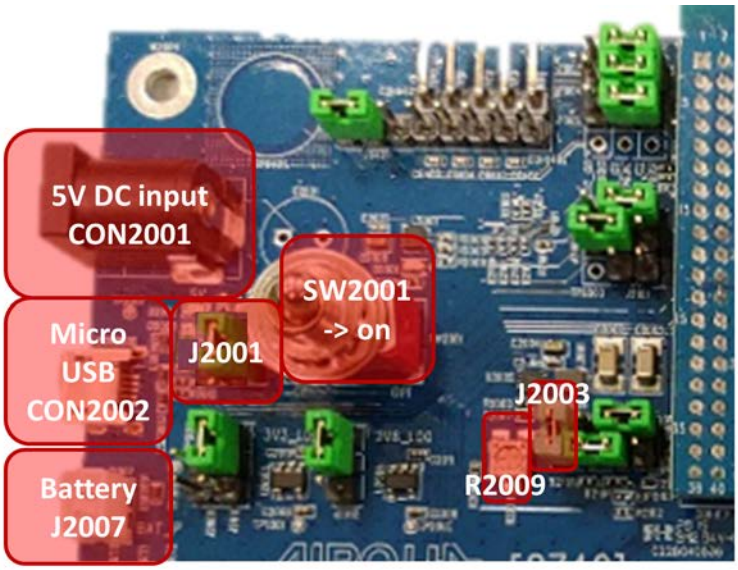
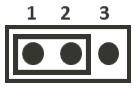
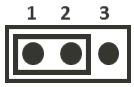


Figure 4.2 Power supply & Charger path

Table 3. Power supply jumper settings

Jumpers setting	CON2001	CON2002	J2007	SW2001	J2001
VBAT: DC 5V➔LDO Charger: X	○	×	×	○	
VBAT: USB 5V➔LDO Charger: X	×	○	×	○	
VBAT: Battery Charger: X	×	×	○	×	×
VBAT: Battery Charger: DC 5V	○	×	○	○	
VBAT: Battery Charger: USB 5V	×	○	○	○	

4.1.3 Charger Path Setting

The AB1565/8 EVK has a 1-wire UART charger path design that can communicate with special charger cases with UART and chargers with a single pin VBUS_UART without another pogo pin. Users can refer to Figure 4.3 and Table 4 to configure how to test with a 1-wire UART charger case.

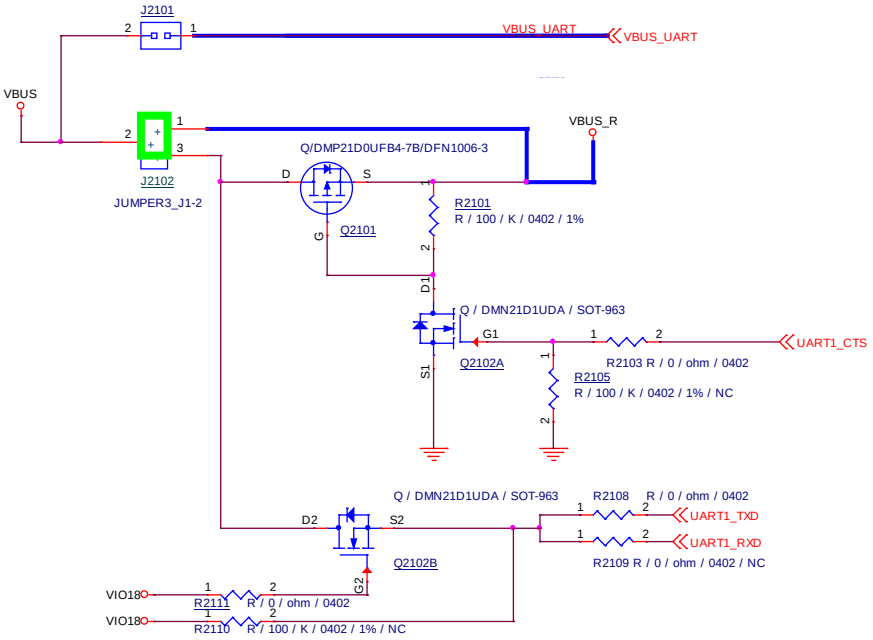
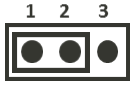
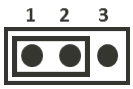


Figure 4.3 1-wire uart charger case

Table 4. 1-wire UART jumper settings

Jumpers setting	J2101	J2102	Q2101	Q2102	J9005	R2102/R2108/R2111
1565 module (Internal)	○	✕	NA	NA	✕	NA
1568 module (External)	✕		○	○		0 ohm 
Normal use (Disable)	✕		NA	NA	✕	NA

4.1.4 DVDDIO

The power supply for different applications must be configured specifically for the intended application. Figure 4.4 shows the DVDDIO and configuration jumper. Pin 2 of J2009 and J20013 is DVDDIO0 and DVDDIO1, respectively. Pin 1 of J2009 and J2013 is VIO18. Pin 3 of J2009 and J2013 is 3V3 from LDO. When the chipset is configured for 3V3, connect Pin 2 and Pin 3 of the jumper.

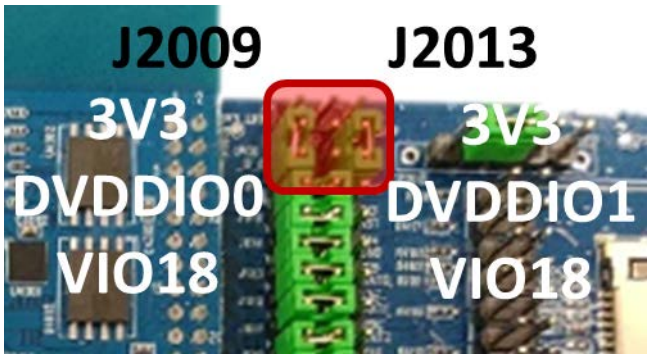
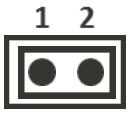
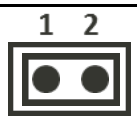


Figure 4.4 DVDDIO jumper location

Table 5. DVDDIO jumper settings

Jumpers	Features/Purpose	Note
J2009	DVDD_IO_0	1-2 for VIO18 (default) 2-3 for 3V3_LDO 
J2013	DVDD_IO_1	1-2 for VIO18 (default) 2-3 for 3V3_LDO 
J2010	DVDD_IO_0	for 2V8_LDO to DVDD_IO_0 
J2014	DVDD_IO_1	for 2V8_LDO to DVDD_IO_1 

4.2 Control and Digital I/O

4.2.1 Module Adaptor Board

Different chipsets/modules can functionally operate with the same EVK motherboard (C742). Each EVK is correctly configured when first distributed.

4.2.2 Key and LED

Figure 4.5 shows the key allocation. SW6401 to SW6407 are TACT switches which pull low each GPIO to the ground when pressed. The device resets by pulling low the RESET_N pin when the RESET_N key is pressed.

J6402 is the jumper connector for the LED power supply. J6402 is attached with a wired jumper by default. J6402 can remain open if the LED is removed.

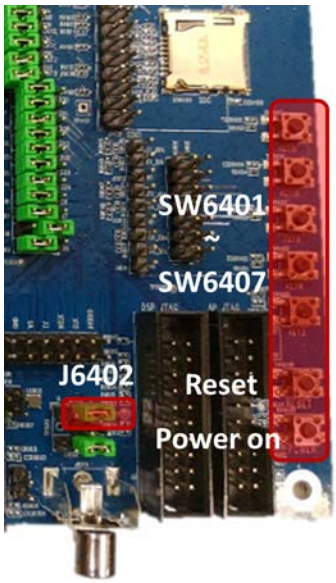


Figure 4.5 Key and LED power

4.2.3 I2C

There is a set of I2C interface test points reserved on the EVK. Figure 4.6 shows the location of these test points. The user can use the test points to connect an external I2C slave device and verify the functionality in integration.

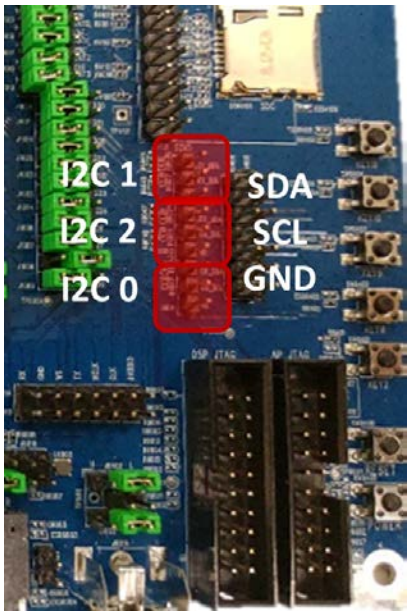


Figure 4.6 I2C interface test points

4.2.4 UART

There are three sets of reserved UART connectors on the EVK. Figure 4.7 shows the UART connector schematic for the GPIO selection.

Figure 4.7 UART interface test points

4.2.5 SDIO/eMMC/ micro SD slot

By default, the MSDC/SDIO interface is connected to the EMMC connector. The GPIO pin mux for the MSDC/SDIO interface can be configured by a switch resistor, as shown in Figure 4.8. The switch resistor, eMMC connector, and SD card holder allocation are shown in Figure 4.9.

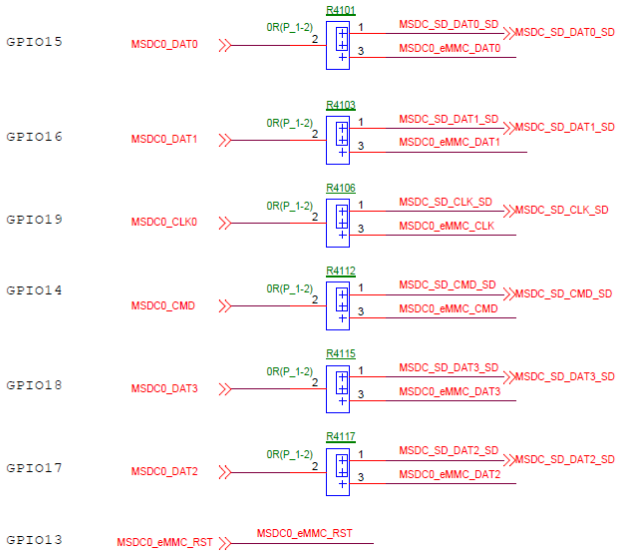


Figure 4.8 SDIO/eMMC interface select resistor.

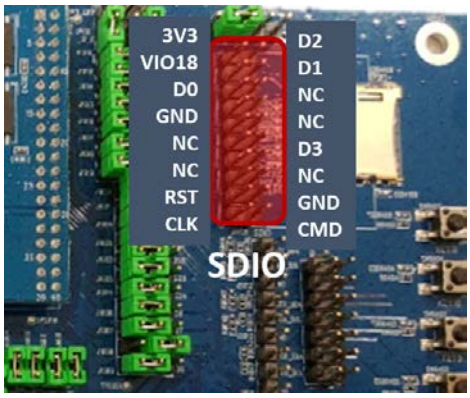


Figure 4.9 SDIO/eMMC interface test points

4.2.6 GPIO

All GPIO test pins are shown in Figure 4.10. You can use these pins to evaluate functions. However, some GPIO are only available with AB1568, such as GPIO21 to GPIO26.

There might be some additional electrical components or circuits connected to the GPIO that you would like to use. Please refer to the EVK schematic to disconnect those jumpers.

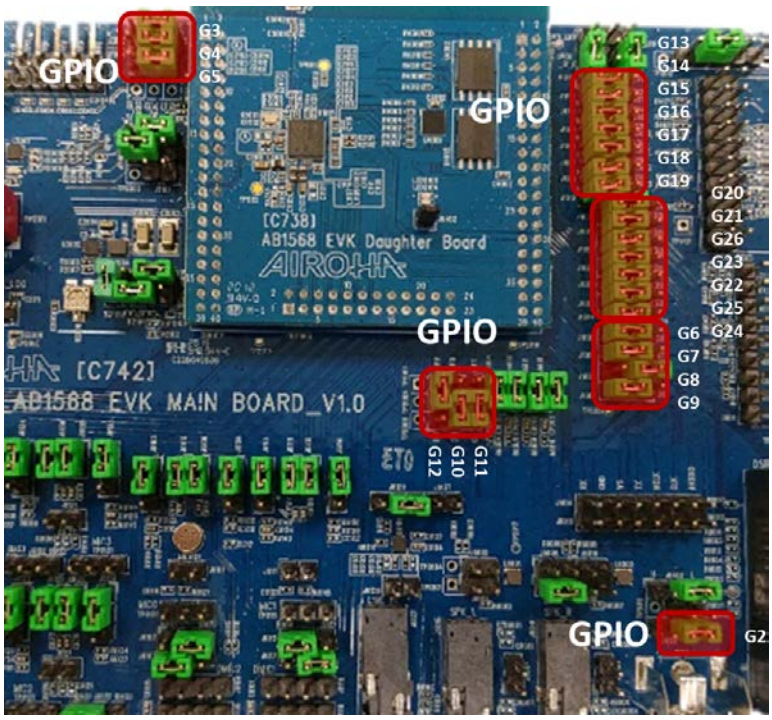


Figure 4.10 All GPIO test points

4.2.7 NTC

AB1565/8 supports a NTC detection circuit which can be used as protection when the temperature of the battery charger increases. Figure 4.11 shows the schematic of the NTC circuit on the AB1565/8 EVK. J2103 can set to thermistor R2106 or a fixed 10kohm resistor R2107, and R2104 can set to AUXADC0 or CHR_THM function.

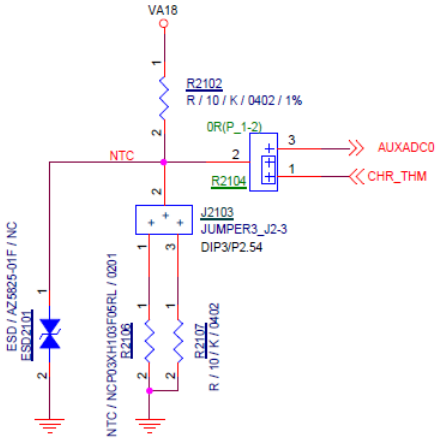


Figure 4.11 NTC schematic

4.2.8 TCB

TCB is a calibration kit for adjusting the ADC/DAC/Crystal of an Airoha chipset. There is a built-in TCB connector J9007 on the EVK. Figure 4.12 shows the location of the TCB connector. J9007 is the default connector for connecting TCB.

R9036, R9039, R9040, R9041 (which are described in the Power Supply and UART sections) must be mounted when performing TCB calibration.

Figure 4.12 TCB connector

4.3 Audio Interface

4.3.1 Analog Audio output path

AB1565/8 has differential mode analog output. AB1565/8 have four wires/audio paths, please refer audio path AU_HP_RP, AU_HP_RN, AU_HP_LP, AU_HP_LN as follow. These four output paths are two sets of differential signals for each channel.

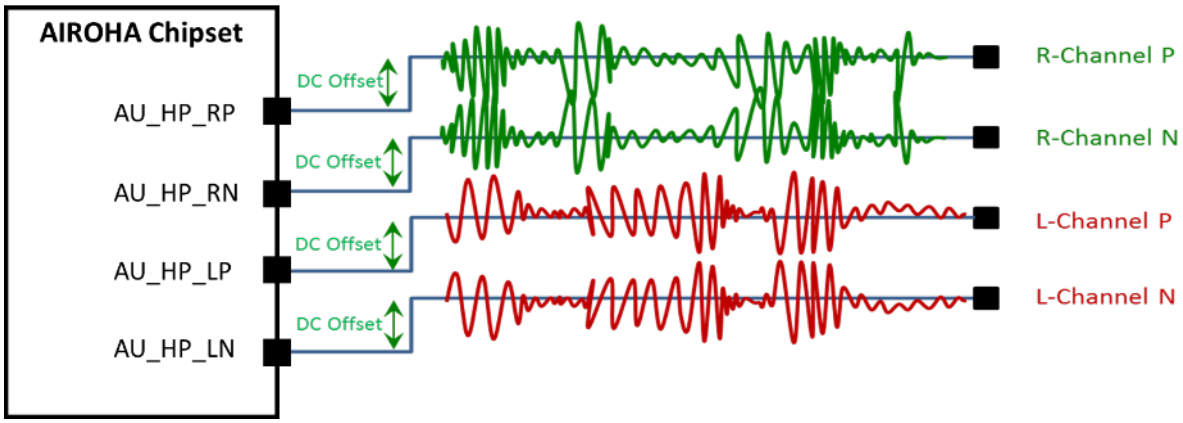


Figure 4.13 Signal output in differential mode

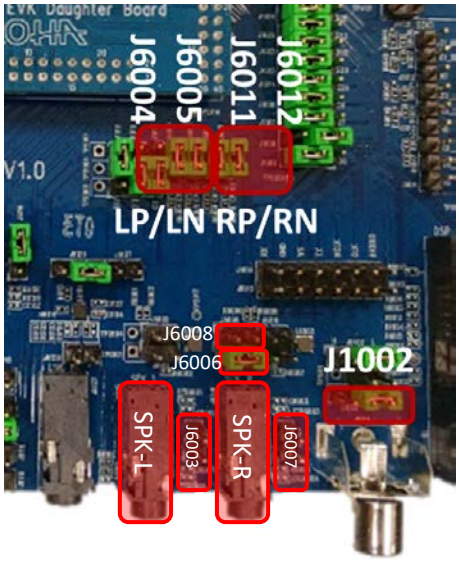


Figure 4.14 Audio jack connection in Differential mode

Figure 4.14 show the audio path of Differential Mode. The jumpers shown in red are connectors. These jumpers must be configured accordingly.

You can use wired headphone to insert SPK-L or SPK-R jack or connect to J6003 or J6007 jumper.

Table 6. On Board ECM Microphone Jumper Setting

Jumpers	Features/Purpose	Note
NA	SPK-L	1. jumper is not necessary, connecting to SPK-L jack works 2. cable headphone connects to J6003
J6008	SPK-R	1. Mount J6008 to connect SPK-R; if you need dual channel Audio (sounds both from AU_HPR), please also mount J6006, the right side of wired headphone can then hear sounds. 2. cable headphone connects to J6007

4.3.2 SPDIF Output

The SPDIF of AB1565/8 is designed only for development dump data for debugging. It cannot be configured for audio output or input. J1002 is the connection between the RCA connector and GPIO pins.

4.3.3 Microphone Path

Figure 4.15, Figure 4.16 and Figure 4.17 show the microphone schematics and jumper location on EVK. J6103, J6104, J6113, J6114 J6123, J6124, J6133, J6134, J6143, J6144, J6153, J6154 is designed for DC couple/AC couple mode changes for ECM microphone. If the layout area is not enough, you can use DCC mode and save capacitors. Please note, the noise flow is worse in the low band of DC couple ECM microphone; it cannot be designed as and FF/FB microphone of ANC. There is an audio jack for connecting an external line-in signal. J6129 is a GPIO selection jumper for Line-in detection. When conducting a line-in function, please do so according to the SW configuration.

Jumper J6137 must be removed if the chipset does not support the line-in function.

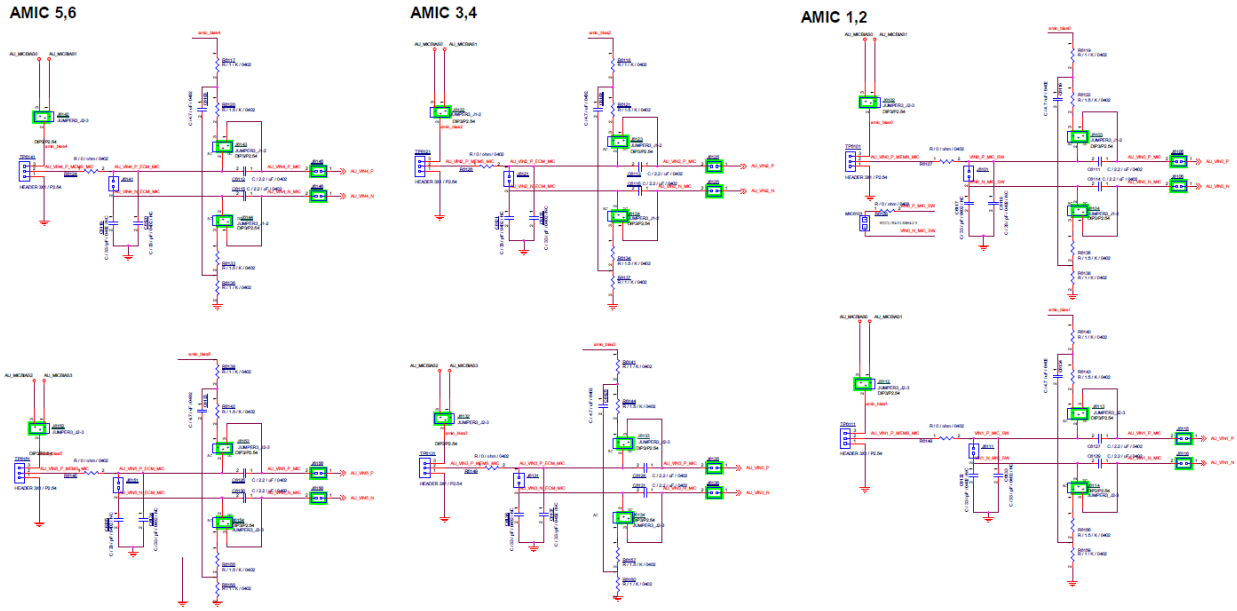


Figure 4.15 Schematics of Analog Microphone Circuit

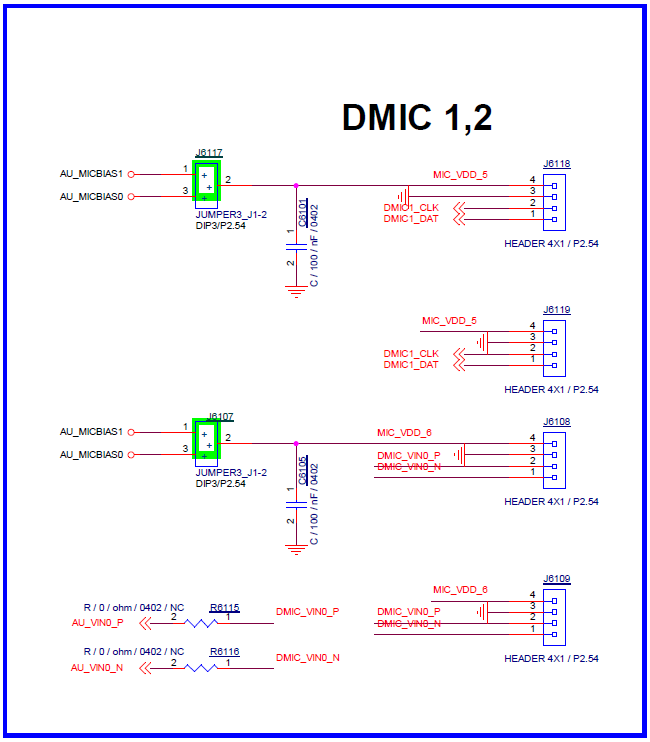


Figure 4.16 Schematics of Digital Microphone Circuit

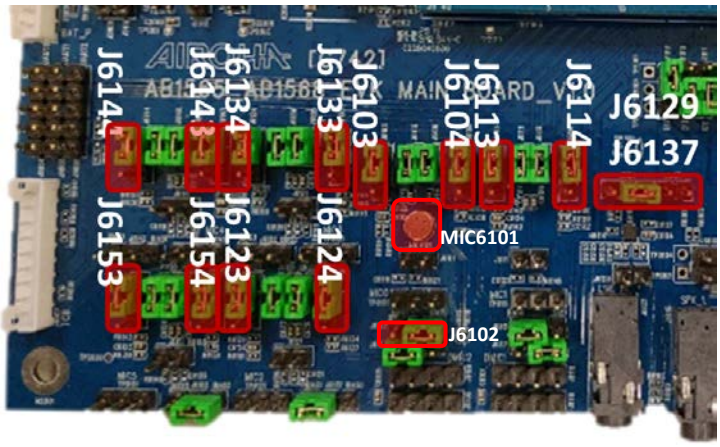


Figure 4.17 Location of Jumper

If you use the onboard ECM MIC (MIC6101) power with MICBias0, please mount J6103 pin2/3; J6104 pin2/3; and J6102 pin2/3 detail. Refer to Table 7 for details.

Table 7. On Board ECM Microphone Jumper Setting

Jumpers	Features/Purpose	Note
J6103	AMIC_BIAS0 Select	1-2 for Bypass C6111 set as DCC mode 2-3 for ECM MIC Pull High (default on)
J6104	AMIC_BIAS0 Select	1-2 for Bypass C6111 set as DCC mode 2-3 for filter MICBIAS noise (default on)
J6102	MICBias 0/1 Select	1-2 Choose Micbias1 2-3 Choose Micbias0

4.3.4 I2S

AB156x chipsets support a set of I2S interfaces; J9014/J9015 are at the bottom-right corner of the EVK motherboard as shown in Figure 4.18. Figure 4.18 also shows the functions of each pin.

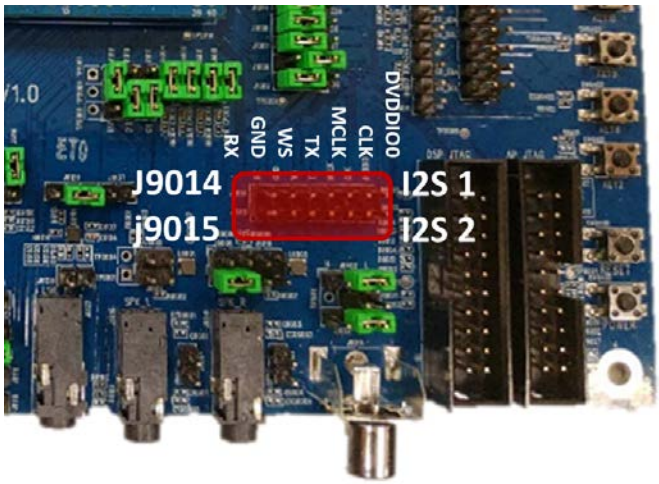


Figure 4.18 Two sets of I2S interface

5. Downloading the Project Image Using the EVK

Airoha IoT Flash Tool downloads the project image. The link to download Airoha IoT Flash Tool is available via the MOL portal.

To download the project file via Airoha IoT Flash Tool:

5.1 Download the firmware with UART

1) Start Airoha IoT Flash Tool and **Open** the image *.cfg file.

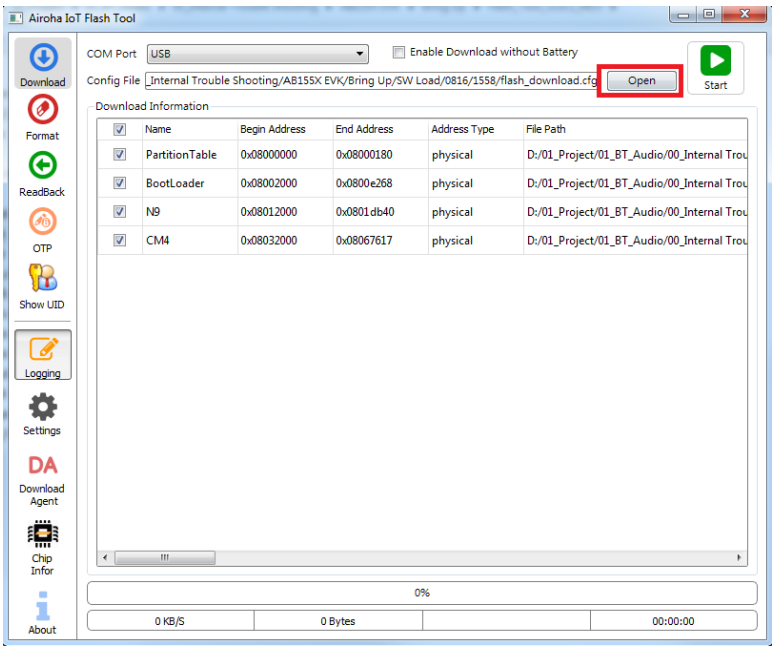


Figure 5.1 Opening the *.cfg file in Airoha IoT Flash Tool

In the device manager (Figure 5.2), confirm the correct UART COM. Make sure the **COM Port** is set to “UART” and then click **Start** As shown in Figure 5.3. Airoha IoT Flash Tool stops so that you can complete the next step.

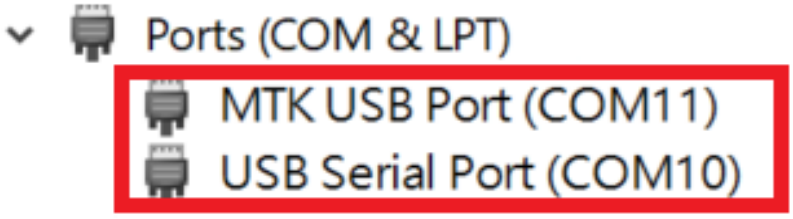


Figure 5.2 Device Manager

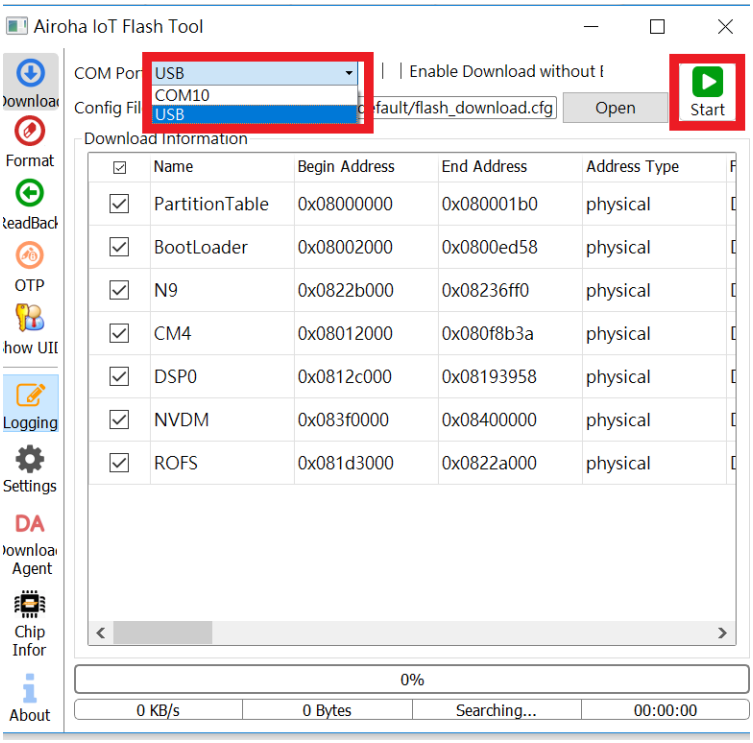


Figure 5.3 Airoha IoT Flash Tool

2) Set the UART on the board as shown in Figure 5.4.

UART Download: Use the UART cable to connect the EVK UART0 and then push the EVK RESET button (SW6406) to start download process.

Airoha IoT Flash Tool shows the progress of the download process.

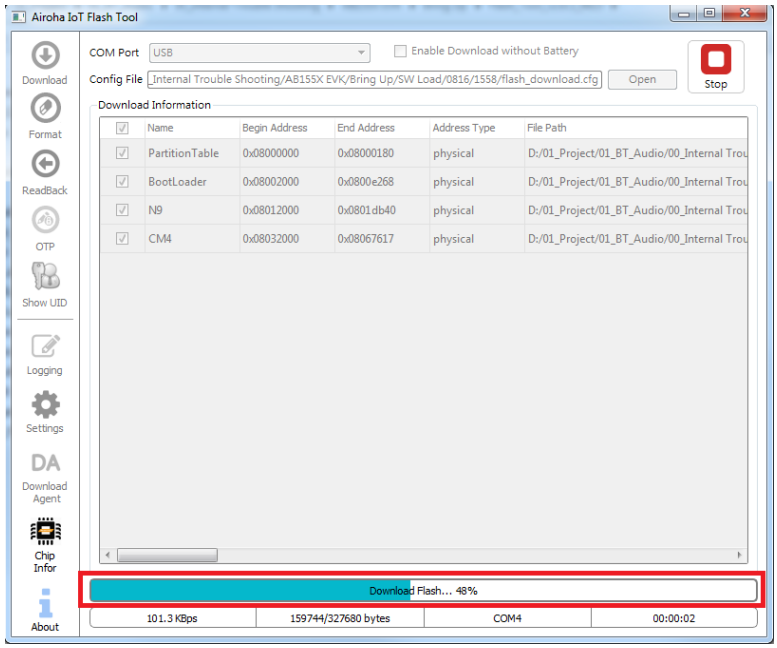


Figure 5.4 Downloading the flash file

3) Airoha IoT Flash Tool shows “Success” when the download is complete. Click any button to close the window.

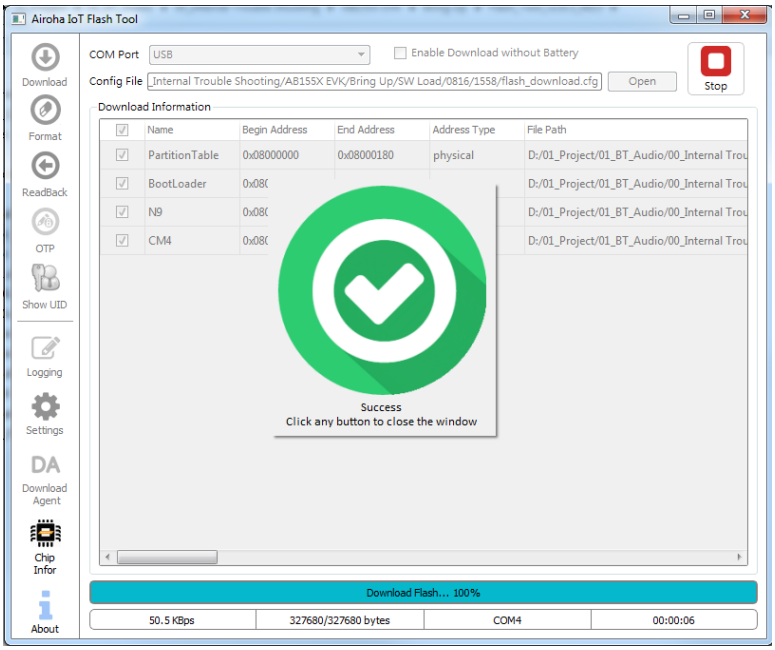


Figure 5.5 Flash download success notification