AB158x Series EVK Users Guide

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Document revision history

Revision	Date	Description
1.0	25 Jan 2022	Initial Version. (C782/C785)

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1. Introduction

AB158X 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 AB1585/88, including GPIO, UART, SPI, I2C/I3C, 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.

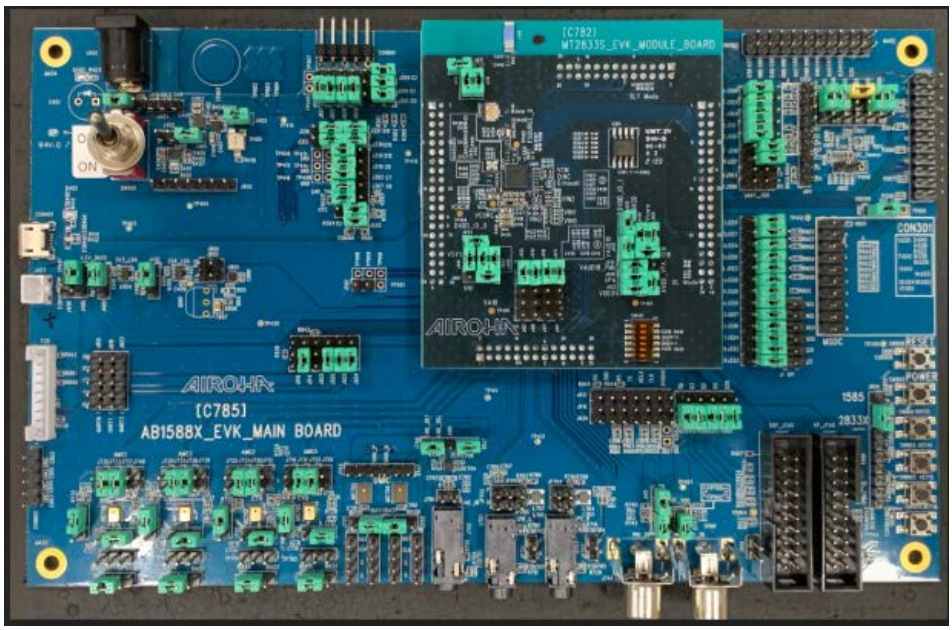

Figure 1-1 Top-view of EVK main board

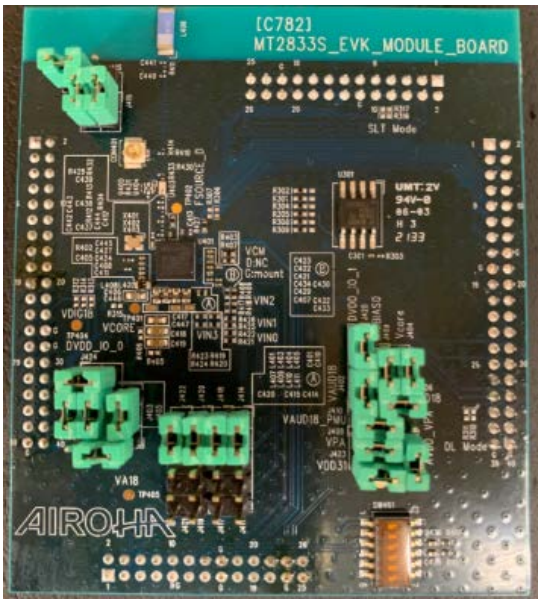

Figure 1-2 Top-view of EVK daughter board

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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.

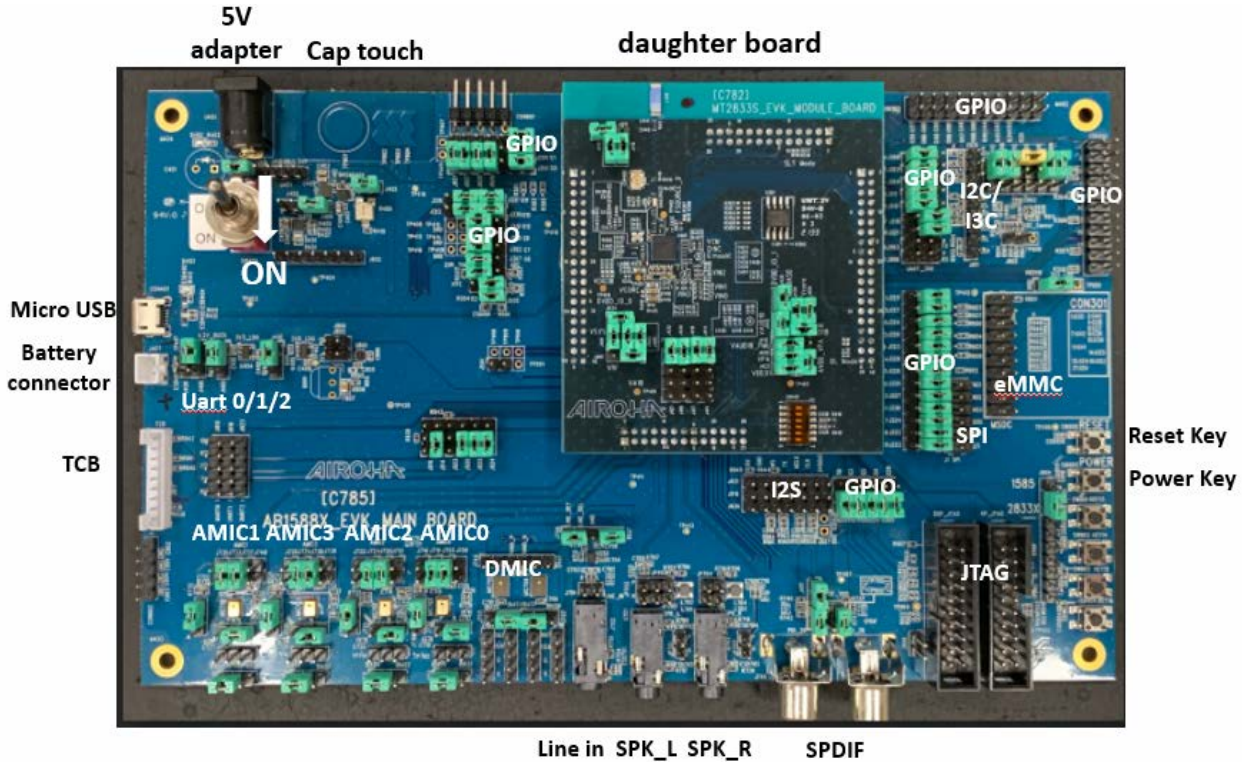

Figure 2-1 Interfaces of EVK

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) Key Button – Power /Reset and GPIO
12) MSDC slot – eMMC interface
13) SPI interface – MST1 and SLV0
14) Touch interface – Touch pad (TP801/TP802/TP803/TP804)

Daughter board

1) Airoha Bluetooth Chipset
2) Antenna – 2.4GHz chip antenna

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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/I3C and SPI communication, an IO control, etc.

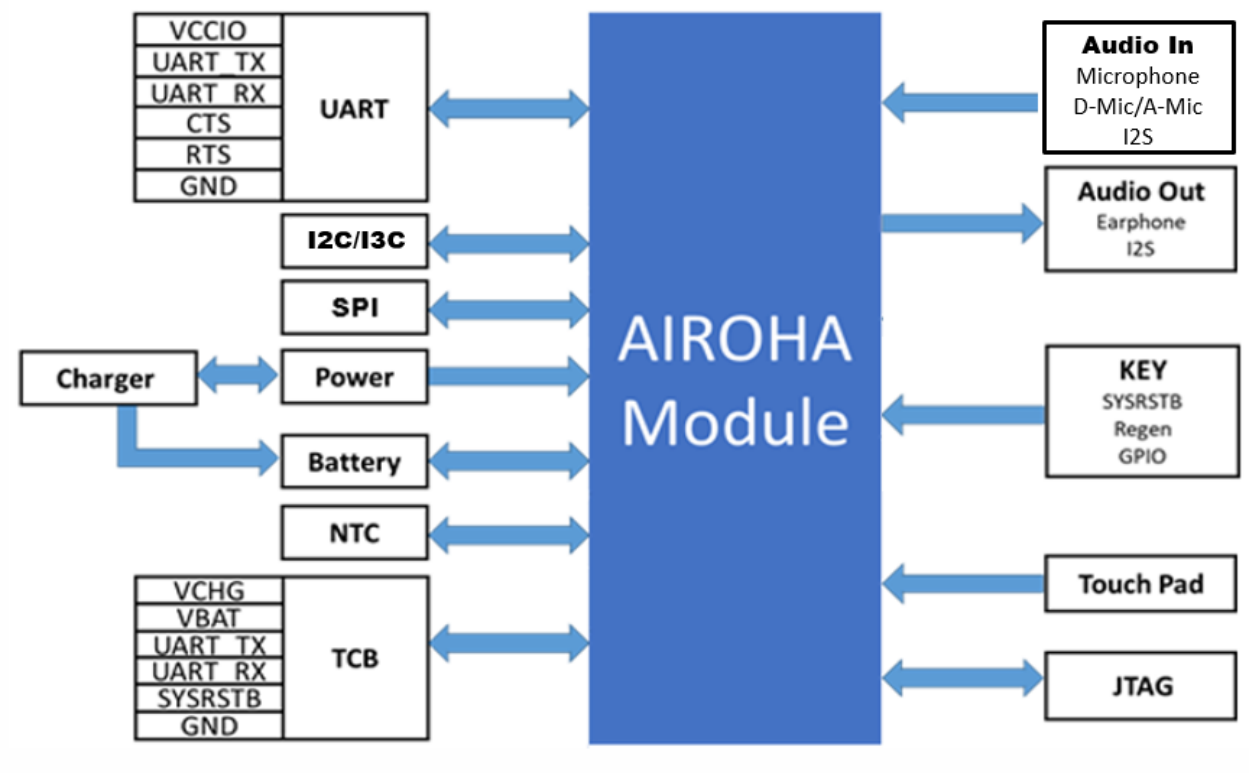

Figure 3-1 EVK Block diagram

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4. Function Blocks

Function blocks of the EVK can be separated into three separate 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.

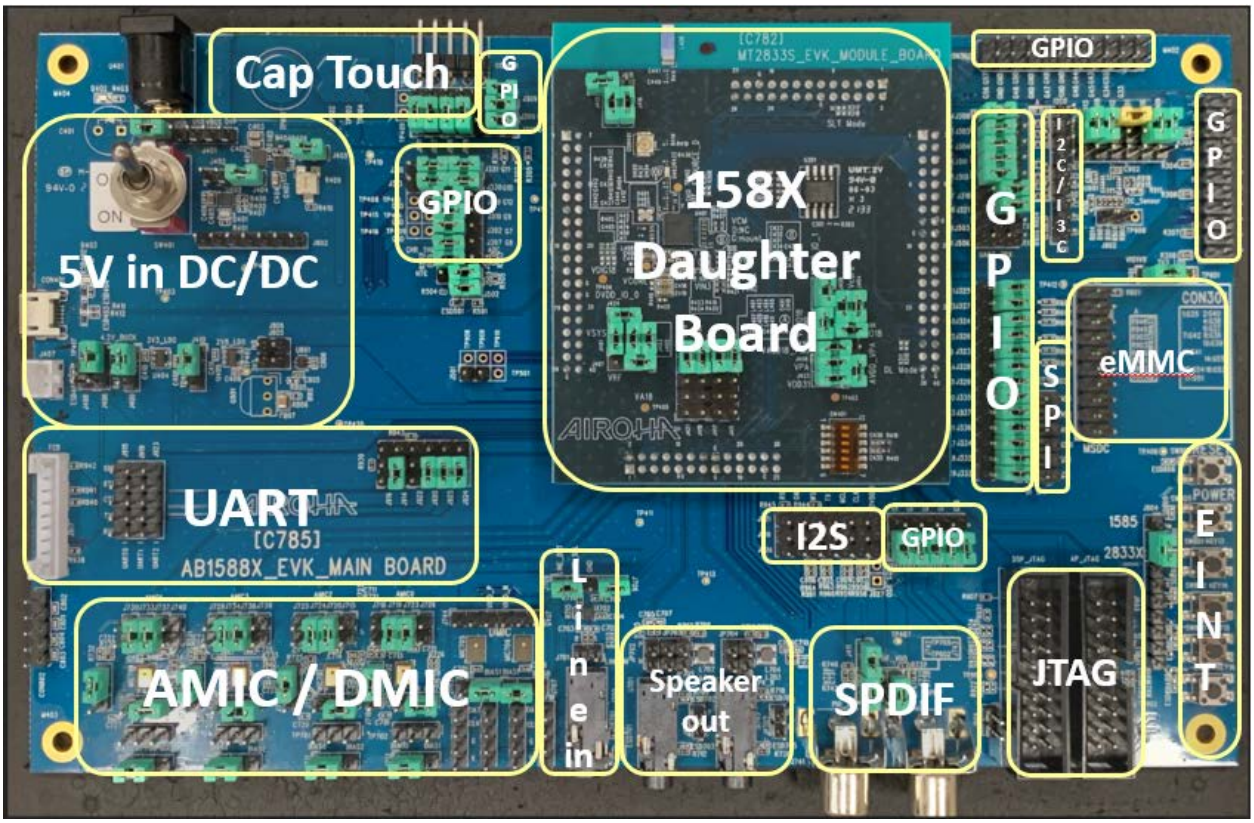

Figure 4-1 Function blocks of EVK

4.1 Peripheral Connections

4.1.1 Power Supply

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

Table 2. Power supply jumper settings

Jumpers setting	5V DC U401	USB CON401	Battery J407	SW401	J403	J401	J406
VBAT: DC 5V➔LDO Charger: X	◯	×	×	◯	1-2	×	2-3
VBAT: USB 5V➔LDO Charger: X	×	◯	×	◯	2-3	×	2-3

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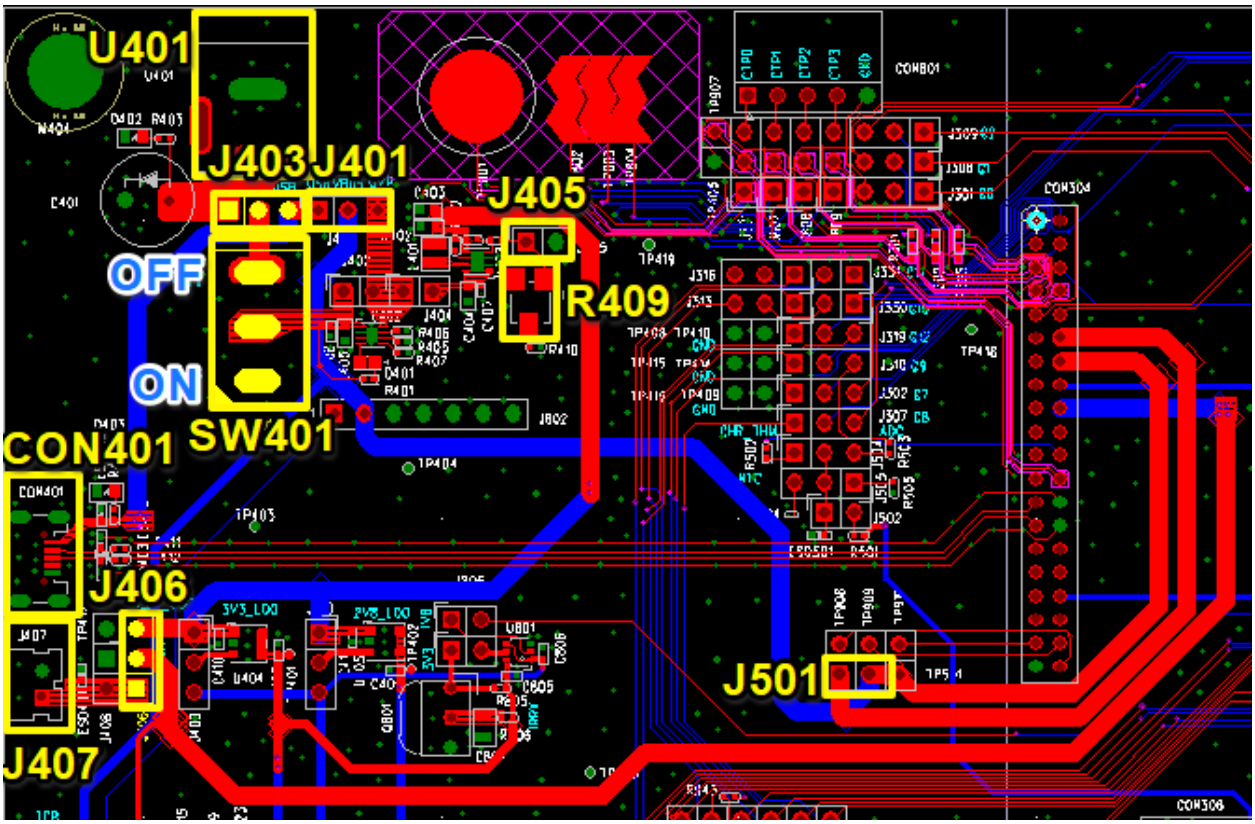
VBAT: Battery Charger: X	×	×	◯	×	×	×	1-2
VBAT: Battery Charger: DC 5V	◯	×	◯	◯	1-2	2-3	1-2
VBAT: Battery Charger: USB 5V	×	◯	◯	◯	2-3	1-2	1-2



- Figure 4-3 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 for power supply. Users can refer to

Table 2 to configure the corresponding power supply.

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

Jumpers	Features/Purpose	Note
J403	5V source	1-2 for DC adaptor input 2-3 for USB Vbus input
J406	VBAT source	1-2 for Battery input 2-3 for external 4V2 Buck
SW401	Switch DC input	Turn right to switch on

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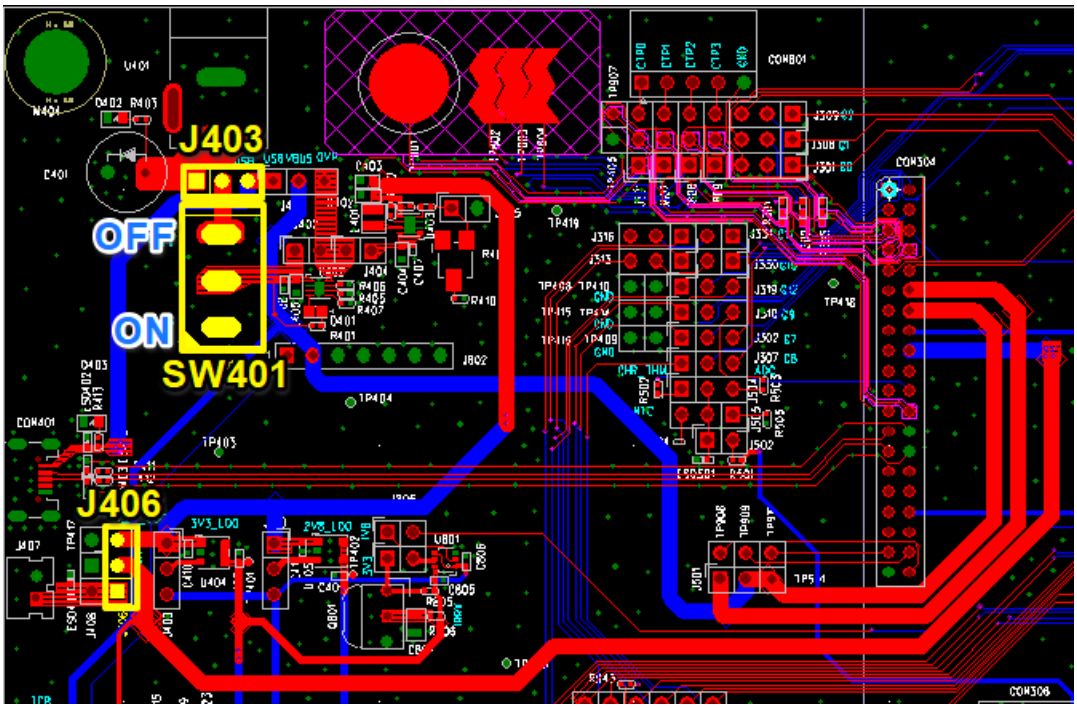

Figure 4-2 Power supply path

4.1.2 BUCK Voltage Tuning

AB1585/AB1588 main board have external BUCK voltage tuning design. Please refer Figure 4-3 and follow description to tuning BUCK output voltage to simulate different voltage battery.

- Plug in J405 BUCK output will fix 4.2V
- Remove J405 and tuning R409, BUCK out will change between 2.52V to 4.2V

Table 2. Power supply jumper settings

Jumpers setting	5V DC U401	USB CON401	Battery J407	SW401	J403	J401	J406
VBAT: DC 5V➔LDO Charger: X	◯	×	×	◯	1-2	×	2-3
VBAT: USB 5V➔LDO Charger: X	×	◯	×	◯	2-3	×	2-3
VBAT: Battery Charger: X	×	×	◯	×	×	×	1-2
VBAT: Battery Charger: DC 5V	◯	×	◯	◯	1-2	2-3	1-2
VBAT: Battery Charger: USB 5V	×	◯	◯	◯	2-3	1-2	1-2

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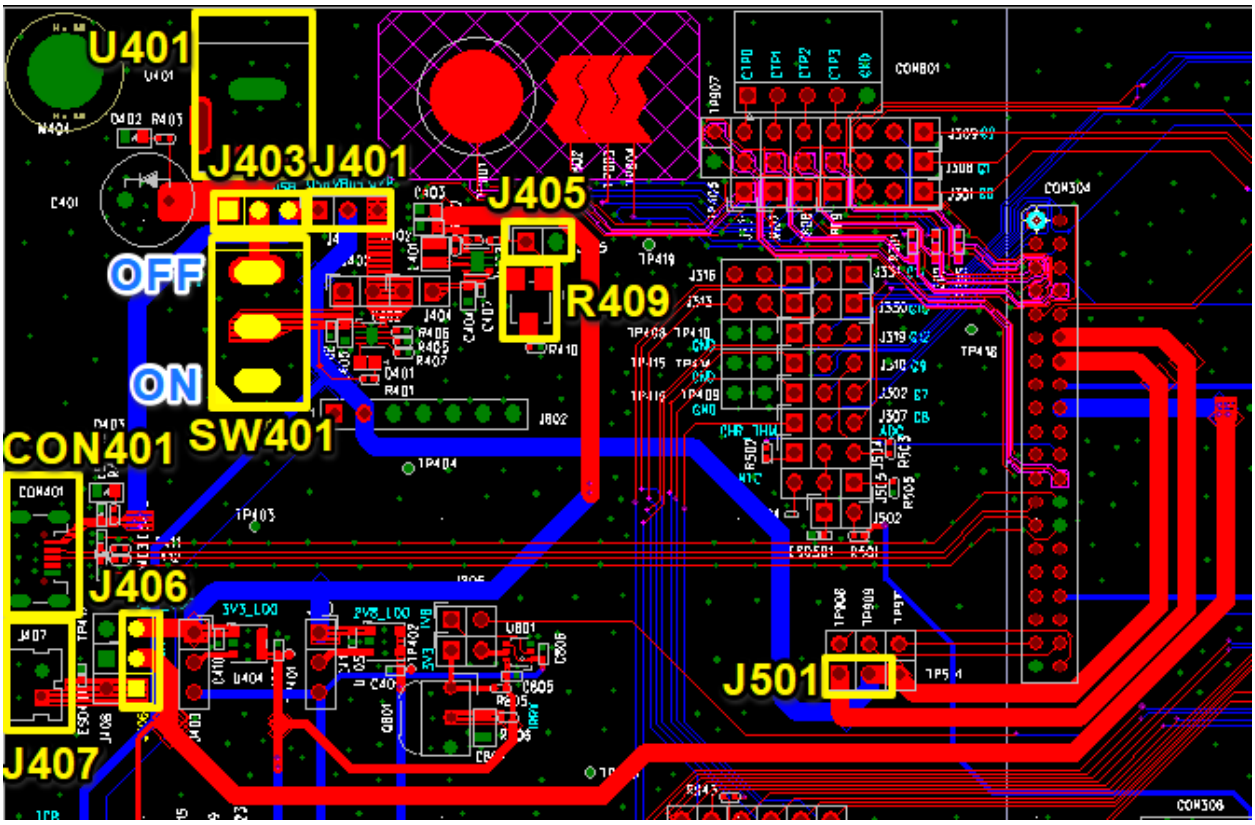

Figure 4-3 Power supply & Charger path

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4.1.3 Charger Path Setting

AB1585/AB1588 EVK have 1-wire UART charger path design and that can communicate with special charger case with UART and charger with single pin VBUS_UART without another pogo pin. Users can refer Figure 4-4 and Table 3 to configure how to test with 1-wire UART charger case.

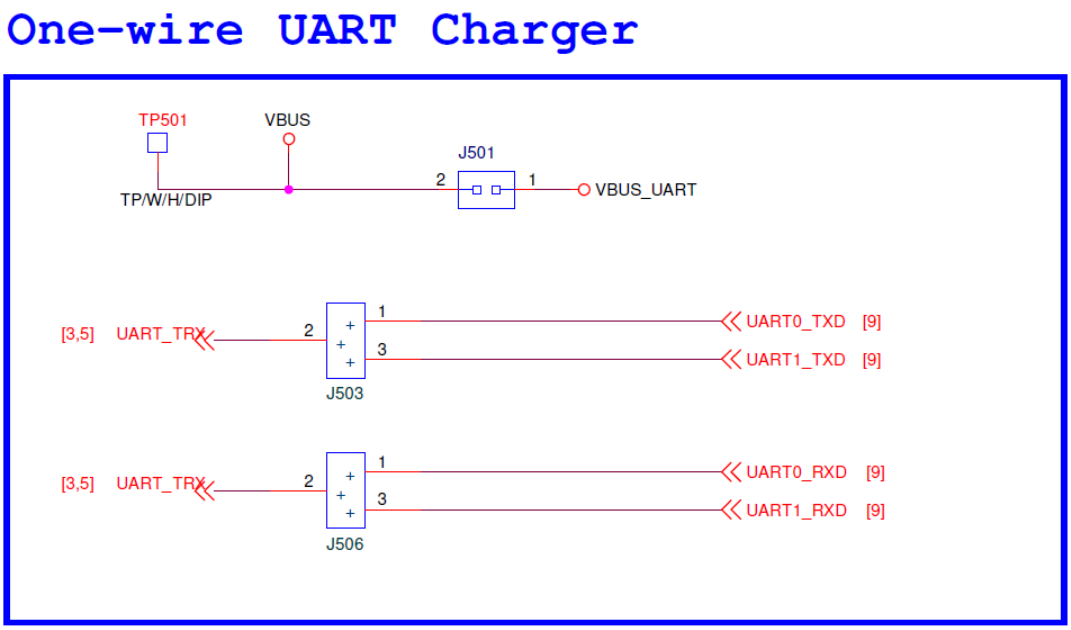

Figure 4-4 1-wire uart charger case

Table 3. 1-wire UART jumper settings

Jumpers setting	J503	J506
1-wire UART via Uart0	1-2	1-2
1-wire UART via Uart1	2-3	2-3

If you want to use charger function only, please refer Table 2's Jumpers setting "VBAT: Battery/Charger: X" and provide 5V to J501-1, if you want use 1-wire UART function, please follow the setting in Table 3 for uart0 or uart1 respectively.

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4.2 Control and Digital I/O

4.2.1 Module Adaptor Board

Different chipsets/modules can functionally operate with the same EVK motherboard (C785). Each EVK is correctly configured when first distributed.

4.2.2 Key

Figure 4-5 shows the key allocation. SW801 to SW804 are TACT switches, which pull low each GPIO to the ground when pressed. The device resets when the RESET_N key is pressed, by pulling low the RESET_N pin.

The J804 is switch High level for AB1585 or low level for AB1588 power key.

Figure 4-5 Key

4.2.3 I2C/I3C

There is a set of I2C/I3C interface test points reserved on the EVK. Figure 4-6 show the location of these test points. The user can use the test points to connect an external I2C/I3C slave device and verify the functionality in integration.

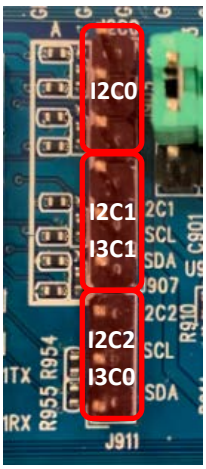

Figure 4-6 I2C/I3C interface test points

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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.

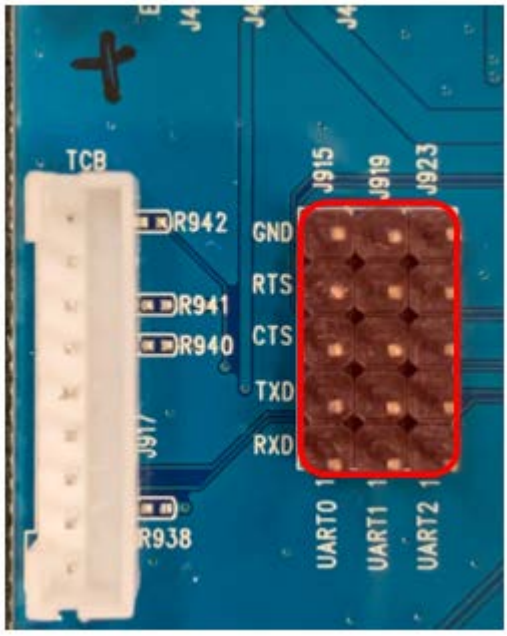

Figure 4-7 UART interface test points

4.2.5 MSDC solt and SPI interface

By default, the MSDC interface is connected to the EMMC connector. The GPIO pin mux for the MSDC/SPI interface can be configured by a switch resistor, as shown in Figure 4-8. The eMMC connector is shown in Figure 4-9.

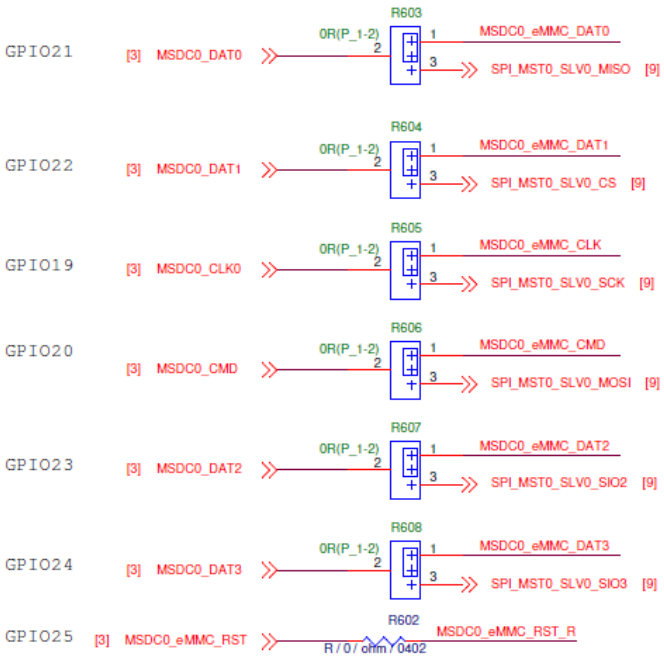

Figure 4-8 eMMC/SPI interface select resistor.

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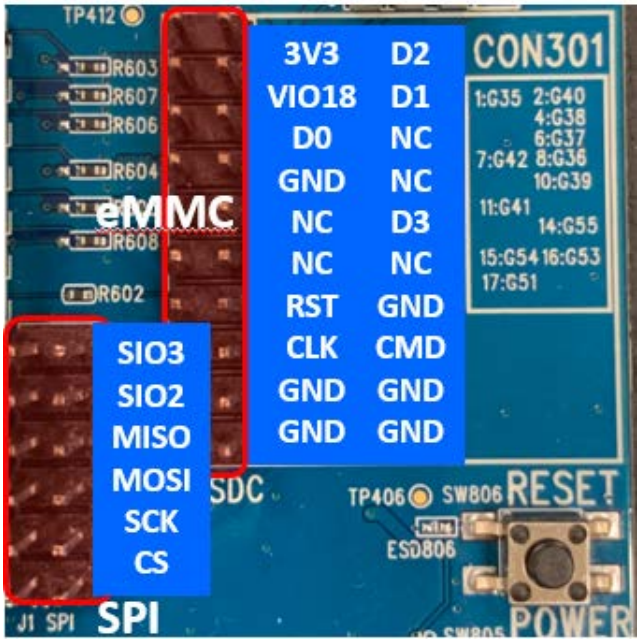

Figure 4-9 eMMC/SPI interface test points

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 AB1588, Like as GPIO27 to GPIO57.

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 Jumper.

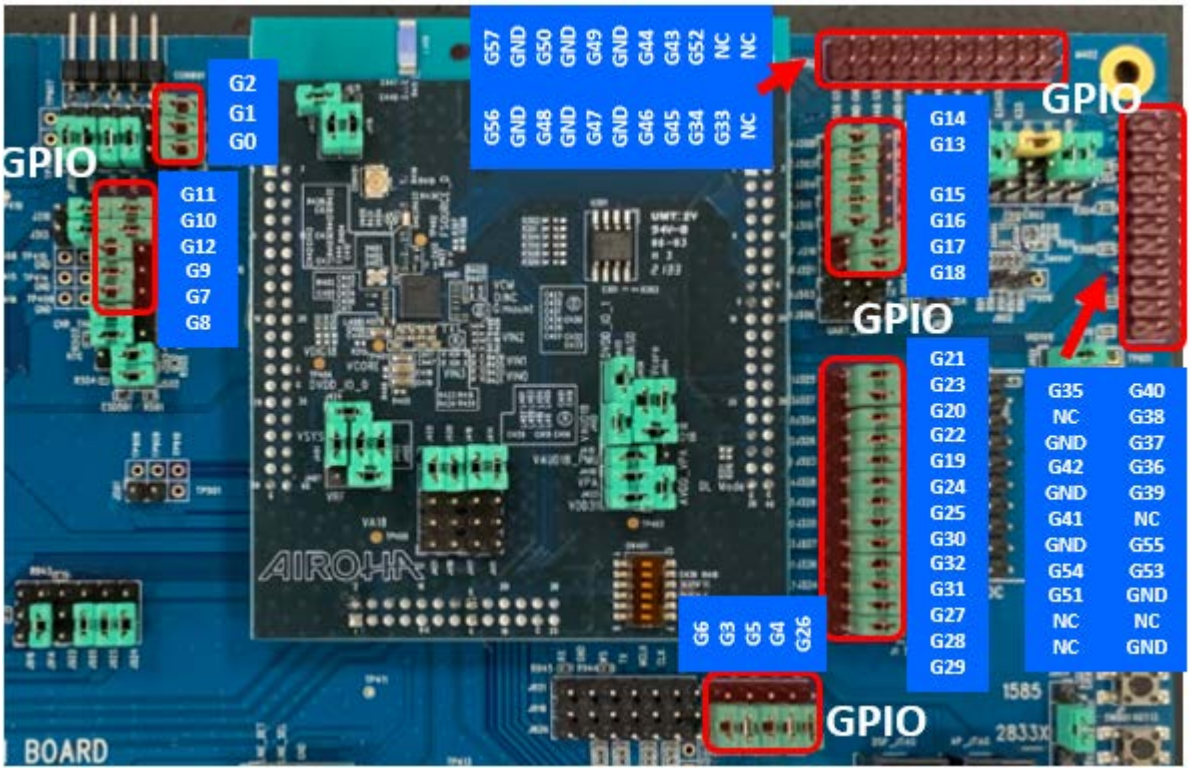

Figure 4-10 All GPIO test points

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4.2.7 NTC

AB1585/AB1588 supports a NTC detection circuit, which can be used as protection from temperature elated to the battery charger. Figure 4-11 shows the schematic of the NTC circuit on the AB1585/AB1588 EVK. J505 can set to thermistor R504 or a fixed 10kohm resistor R505, and J504 can set to AUXADC0 or CHR_THM function.

Table 4. NTC Jumper setting

Jumpers setting	J502	J504
AB1585	×	2-3
AB1588	◯	1-2

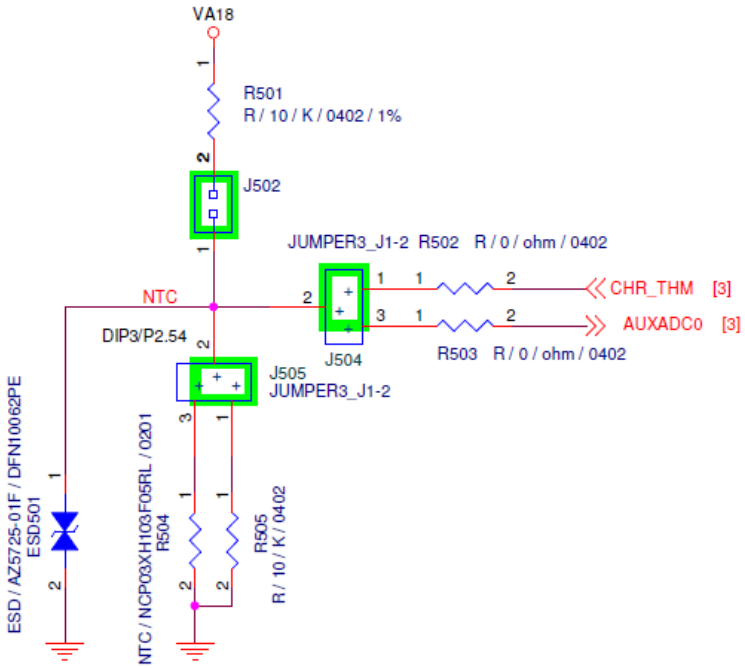

Figure 4-11 NTC schematic

4.2.8 Touch function

AB1585/AB1588 supports internal touch function. Follow Table 5Table 5. Touch jumper setting to set the jumper correctly. Only RTC_GPIO0 supports wake-up from RTC mode.

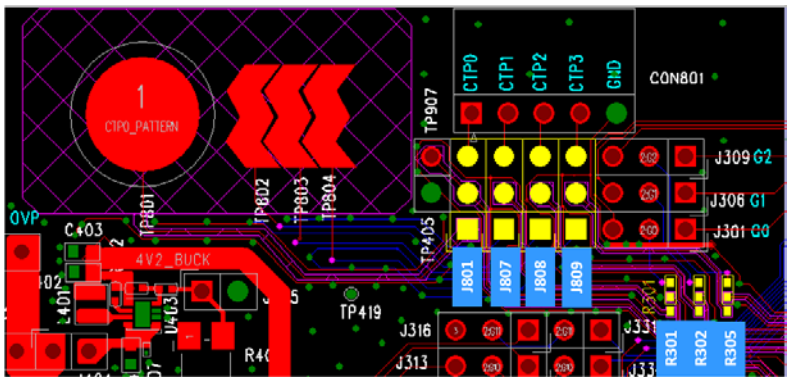

Figure 4-12 Touch function

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Table 5. Touch jumper setting

Jumpers setting	J801	GPIO0		GPIO1		GPIO2	
		R301	J807	R302	J808	R305	J809
RTC_GPIO0	1-2	×	×	×	×	×	×
CTP1	×	2-3	1-2	×	×	×	×
CTP2	×	×	×	2-3	1-2	×	×
CTP3	×	×	×	×	×	2-3	1-2

4.2.9 TCB

TCB is a calibration kit for adjusting the ADC/DAC/Crystal of an Airoha chipset. There is a built-in TCB connector J917 on the EVK. Figure 4-13 shows the location of the TCB connector. J917 is the default connector for connecting TCB.

R938, R940, R941, R942 (which are described in Power Supply and UART section) must be mount when performing TCB calibration.

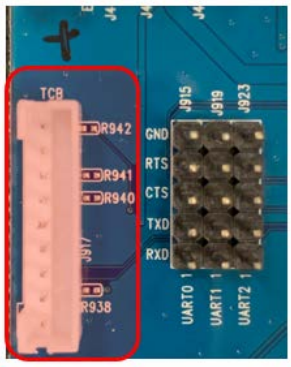

Figure 4-13 TCB connector

4.2.10 FSOURCE_D

FSOURCE_D is an eFuse write power source, if you want to write Efuse, please provide VIO18 voltage to TP402.

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4.3 Audio Interface

4.3.1 Analog Audio output path

AB1585/AB1588 has differential mode analog output. AB1585/AB1588 have four wires/audio paths, please refer to the Figure 4-14 for audio paths AU_HP_RP, AU_HP_RN, AU_HP_LP, AU_HP_LN. These four output paths are two sets of differential signals for each channel.

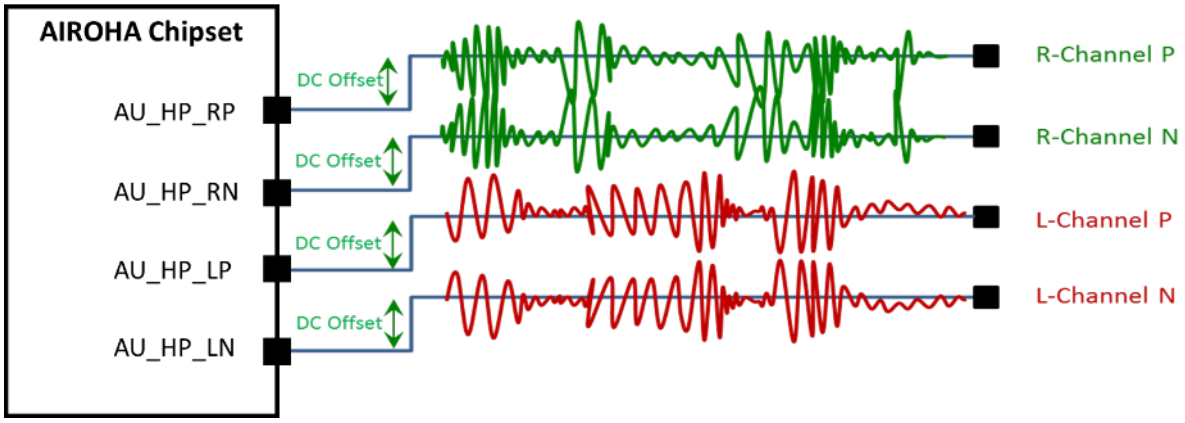

Figure 4-14 Signal output in differential mode

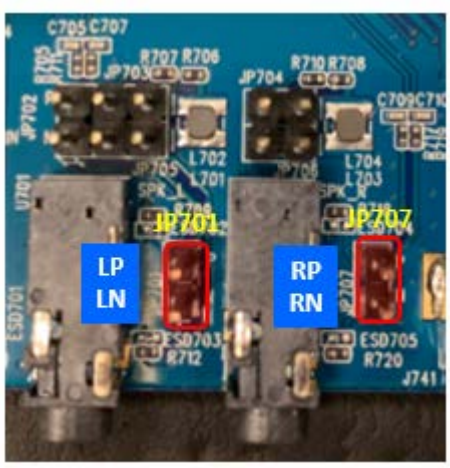

Figure 4-15 Audio jack connection in Differential mode

Figure 4-15 show the audio path of Differential Mode. The jumpers shown in red are connectors. These jumpers must be configured accordingly.

4.3.2 SPDIF Output

The SPDIF of AB1585/AB1588 only design for development dump data for debugging. It cannot be configured for audio output or input.

4.3.3 Microphone Path

Figure 4-16, Figure 4-177 and Figure 4-18 show the microphone schematics and jumper location on EVK. J716, J726, J730, J740, J715, J725, J729, J739 is design for DC couple/AC couple mode change for ECM microphone. If the

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layout area is not enough, you can use DCC mode and save capacitors. Please note, the noise flow in low band of DC couple ECM microphone is worse, it cannot be designed as FF/FB microphone of ANC. There is an audio jack for connecting an external line-in signal. J709 is a GPIO selection jumper for Line-in detection. When conducting a line-in function, please do so according to the SW configuration.

Jumper J706 must be removed if the chipset does not support the line-in function.

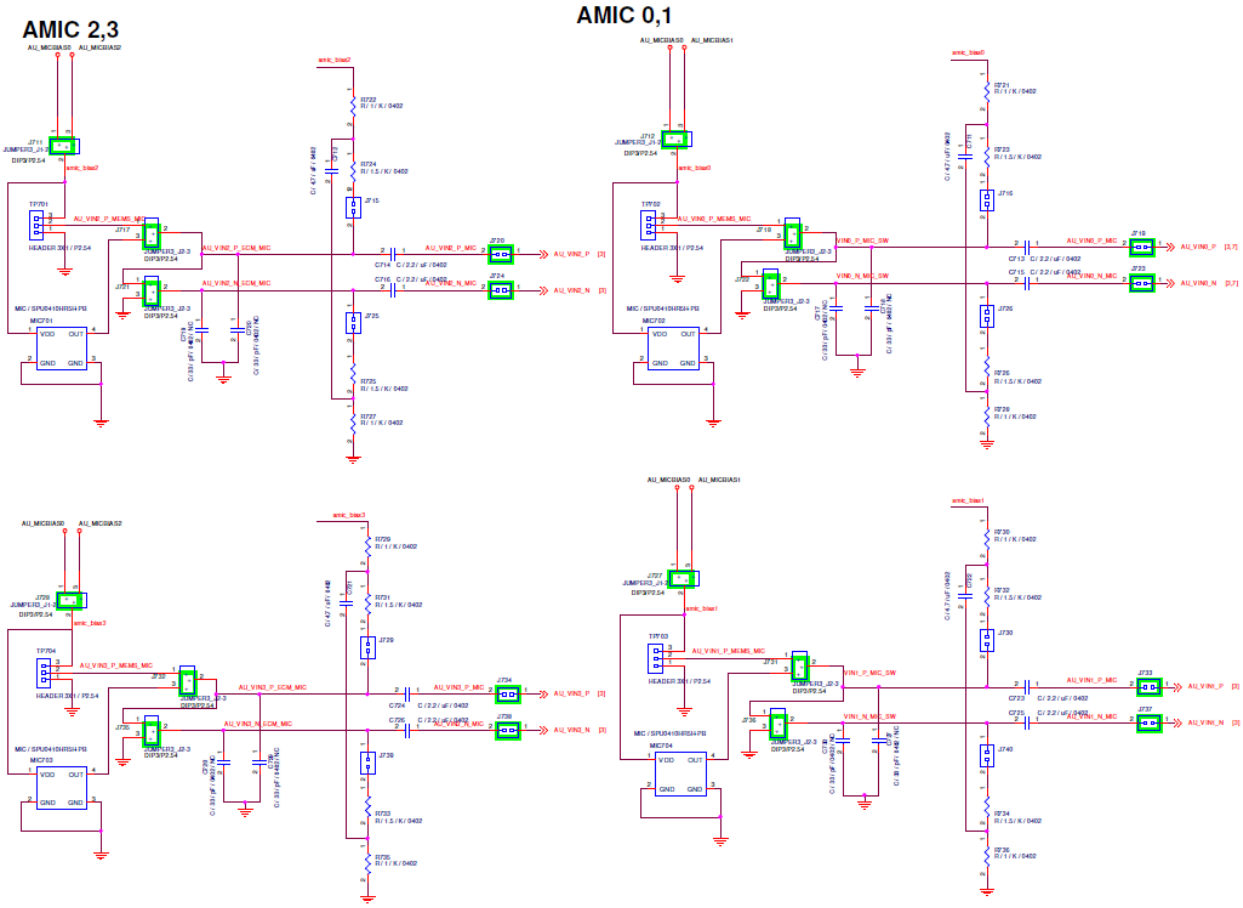

Figure 4-166 Schematics of Analog Microphone Circuit

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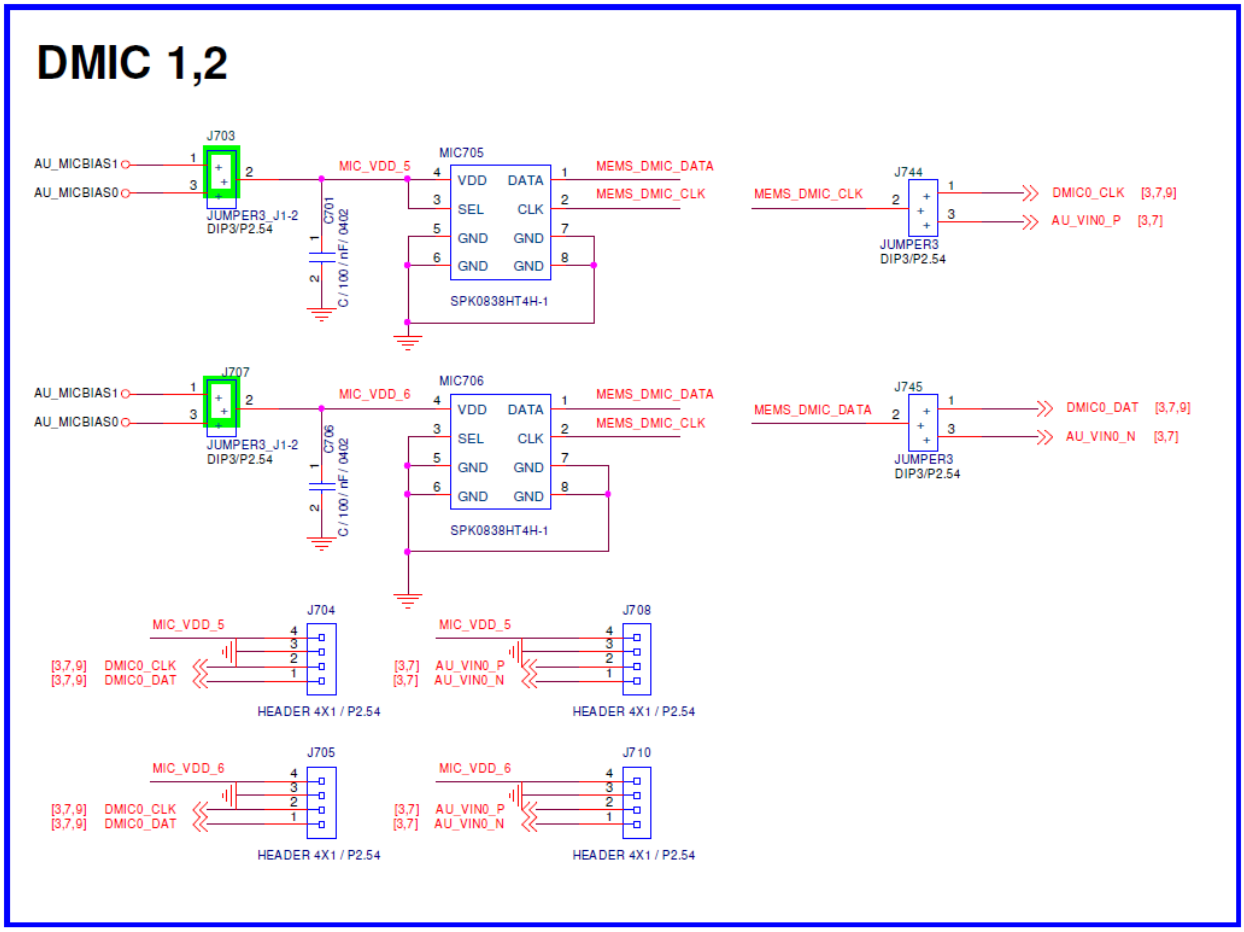

Figure 4-17 Schematics of Digital Microphone Circuit

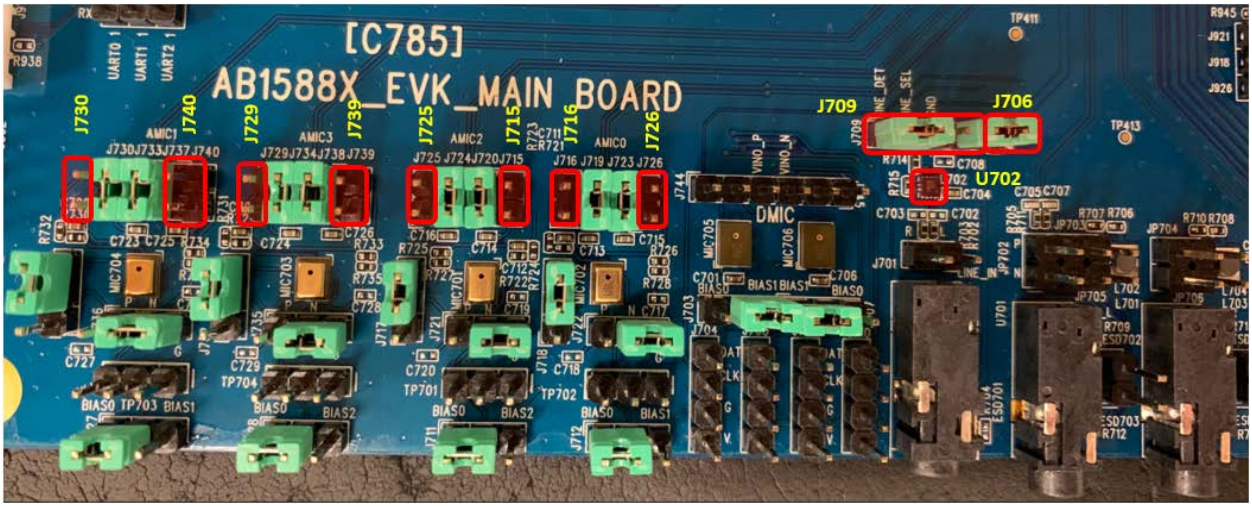

Figure 4-18 Location of Jumper

4.3.4 I2S

AB158X chipsets support a set of I2S interfaces; J918/J921 are at the bottom-right corner of the EVK motherboard, as shown in Figure 4-19. Figure 4-19 also shows the functions of each pin.

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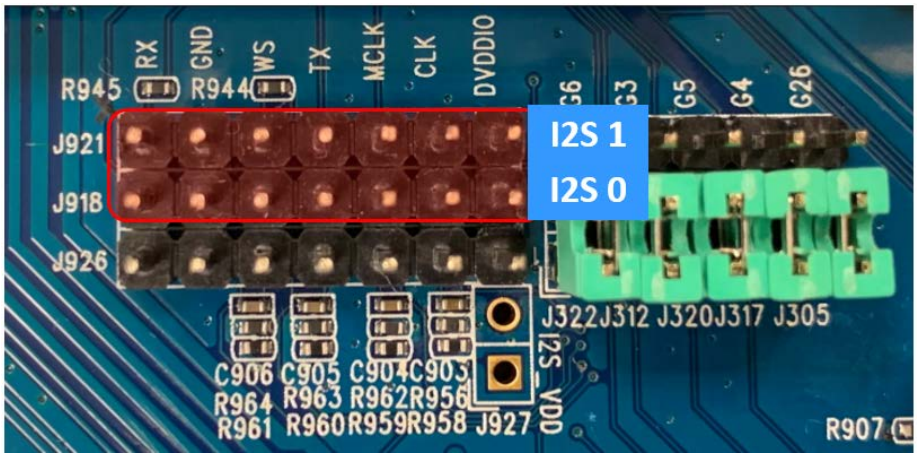

Figure 4-19 Two sets of I2S interface

4.3.5 Line in

AB158X chipsets support a set of line in interfaces; J706 is at the bottom-right corner of the EVK motherboard, as shown in Figure 4-18. Figure 4-18Figure 4-19 is bias jumper of U702 switch, the switch will detect the Line Jack to switch the line path or mic path.

Line-in for AU_VIN2/3 (ACC 10k): Remove J414/J418/J420/J422 and connect J411/J417/J419/J421 pin1-2 to switch 5.1kohm as shown in Figure 4-20Figure 4-18.

Line-in for AU_VIN2/3 (ACC 20k): Remove J414/J418/J420/J422 and connect J411/J417/J419/J421 pin2-3 to switch 12kohm as shown in Figure 4-20.

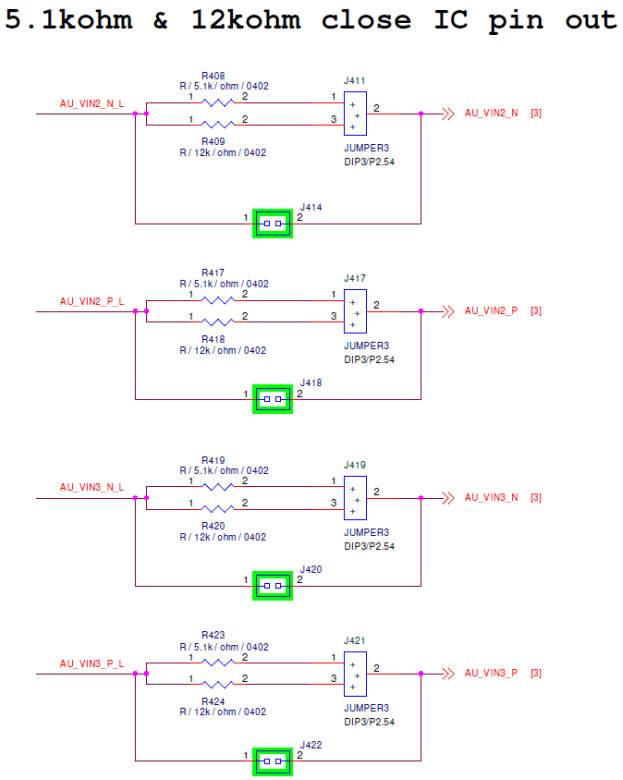

Figure 4-20 line-in for AU_VIN2/3 ACC10K/20K schematic

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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.

The following section shows how 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.

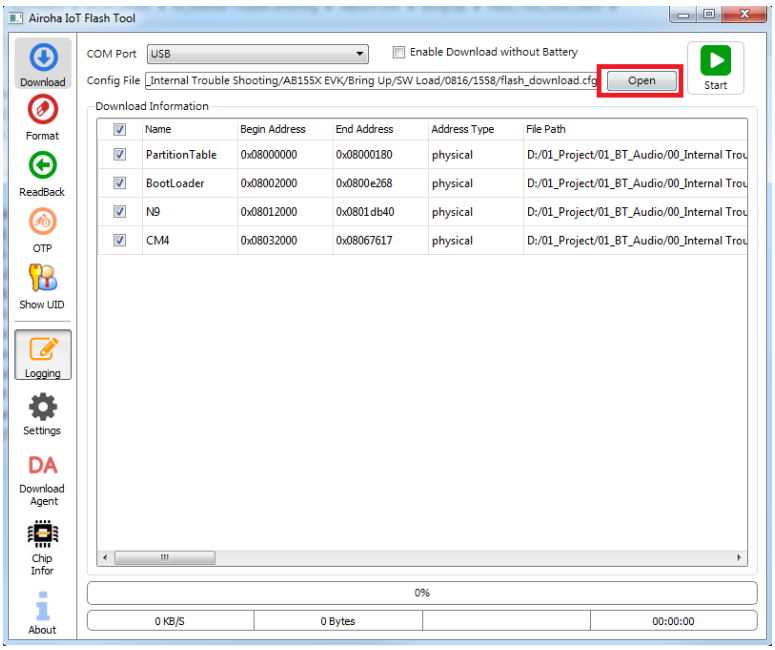

Figure 5-1 Opening the *.cfg file in Airoha IoT Flash Tool

In the device manager (Figure 5-2) to confirm the correct UART COM. Make sure the **COM Port** is set to "UART" and then click **Start**. Figure 5-3

Airoha IoT Flash Tool stops so that you can complete the next step.

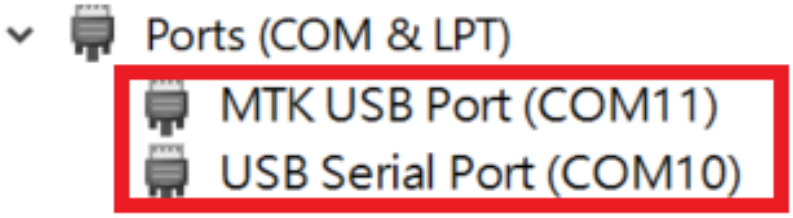

Figure 5-2 Device Manager

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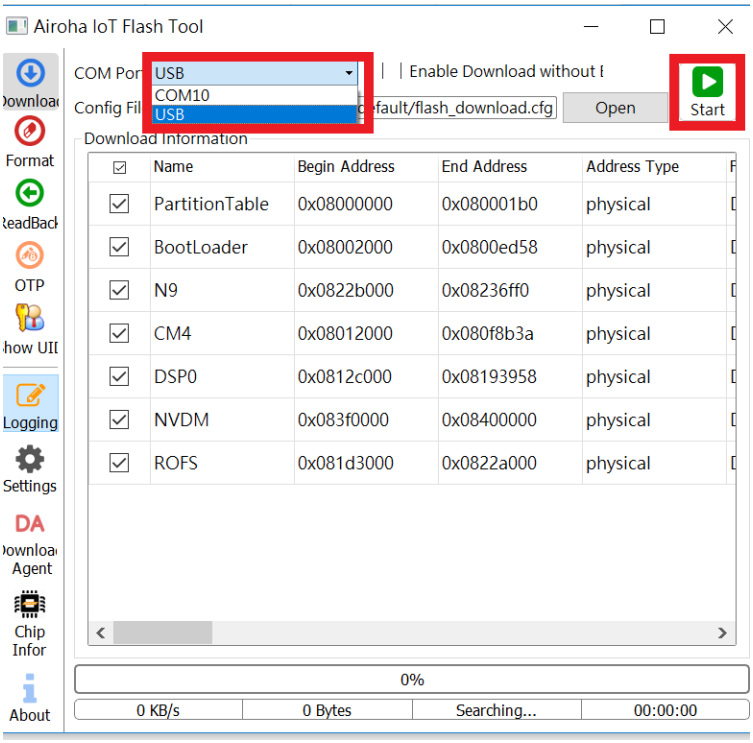

Figure 5-3 Airoha IoT Flash Tool

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 (SW806) to start download process.

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

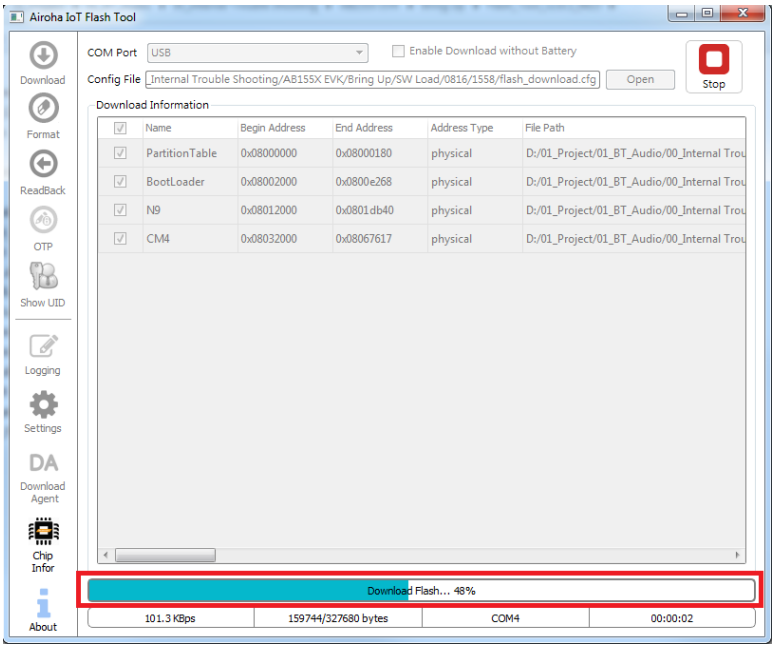

Figure 5-4 Downloading the flash file

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

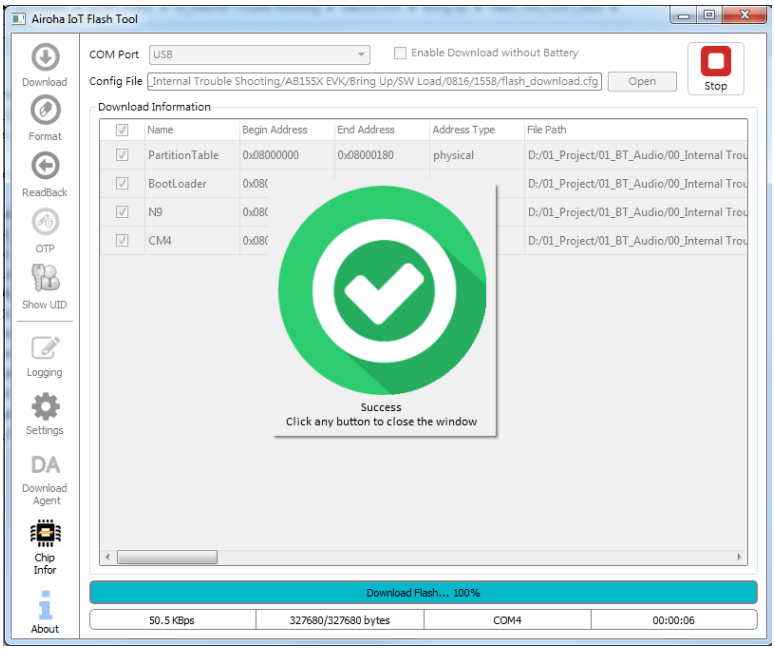

Figure 5-5 Flash download success notification

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