



UG1002

RTL8721DGF, RTL8721DGM, RTL8722FAM User Guide—Evaluation Board

This document describes the evaluation board based on RTL8721DGF, RTL8721DGM, and RTL8722FAM.

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USING THIS DOCUMENT

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide.

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1 Overview

1.1 Introduction

The evaluation board (EVB) based on RTL8721DGF, RTL8721DGM, RTL8722FAM is designed to provide users with flexible function demonstration and usage evaluation. It builds the minimum system including power supply and clock, and provides various circuits such as Wi-Fi, Audio, OSPI, ADC, SDIO, GPIO, etc. Users can configure the functions freely by using the Software Development Kit (SDK) and related tools provided by REALTEK.

1.2 Features

The EVB based on RTL8721DGF, RTL8721DGM, RTL8722FAM includes the following features:

- External NOR Flash (Optional in RTL8721DGF)
- Supports for ARM's SWD and SEGGER J-Link protocol options
- 5V DC power supply through USB-C socket
- Buttons for chip reset and UART download
- PCB and external antenna option for Wi-Fi
- SDIO, OSPI, USB, Cap-touch interfaces and related on-board circuits
- Audio circuits of DMIC and power amplifier for speaker.
- User LED circuits

2 Quick Start

2.1 Power

The EVB based on RTL8721DGF, RTL8721DGM, RTL8722FAM can be powered by connecting a USB cable between PC and board in USB-C socket.

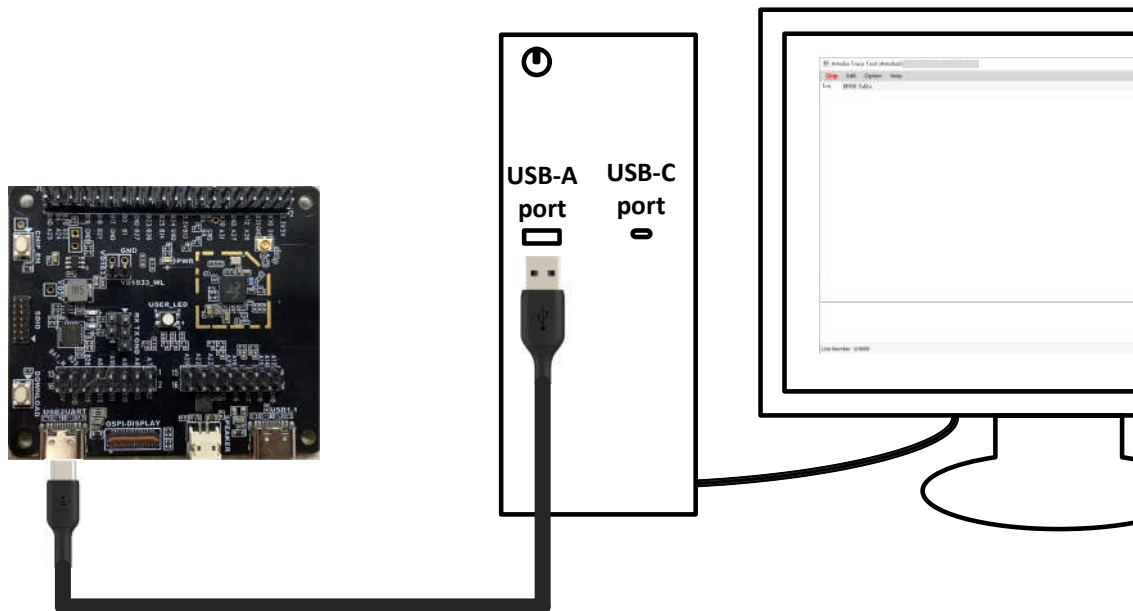


Figure 2-1 RTL8721DGF, RTL8721DGM, RTL8722FAM EVB power supply schematic

2.2 FLASH Download

Users are allowed to download their own bin files into the FLASH through either LOGUART port or USB port of RTL8721DGF, RTL8721DGM, RTL8722FAM.

i NOTE

Before downloading bin files into RTL8721DGF, RTL8721DGM, RTL8722FAM, please refer to the application note (AN1000) for detailed instructions.

2.3 Log

LOGUART is an important way for users to interact with the chip. Users can judge the working status of the code and perform online operations through the log transferred by the serial port.

The default transmission formats and transfer speed of LOGUART are: 8bits data, no parity bit, 1stop bit and 1.5Mbps respectively.

i NOTE

- The EVB has integrated a USB to UART IC on board so that the LOGUART function can be available only through a regular USB-A/USB-C to USB-C cable.
- Users can freely use any serial tool to communicate between PC and RTL8721DGF, RTL8721DGM, RTL8722FAM. If Trace Tool provided by REALTEK is chosen, please refer to the application note (AN1000) for detailed instructions.

2.4 Functions

The EVB based on RTL8721DGF, RTL8721DGM, and RTL8722FAM provides many functions for users to use freely. When users want to use a specific function, please follow the following steps:

- (1) Confirm the available pin for the function through the PINMUX document.
- (2) Find the location of the pin according to Figure 3-3 and Table 3-1.

3.1.2 Bottom Layer

The bottom layer of the EVB is illustrated in Figure 3-2.

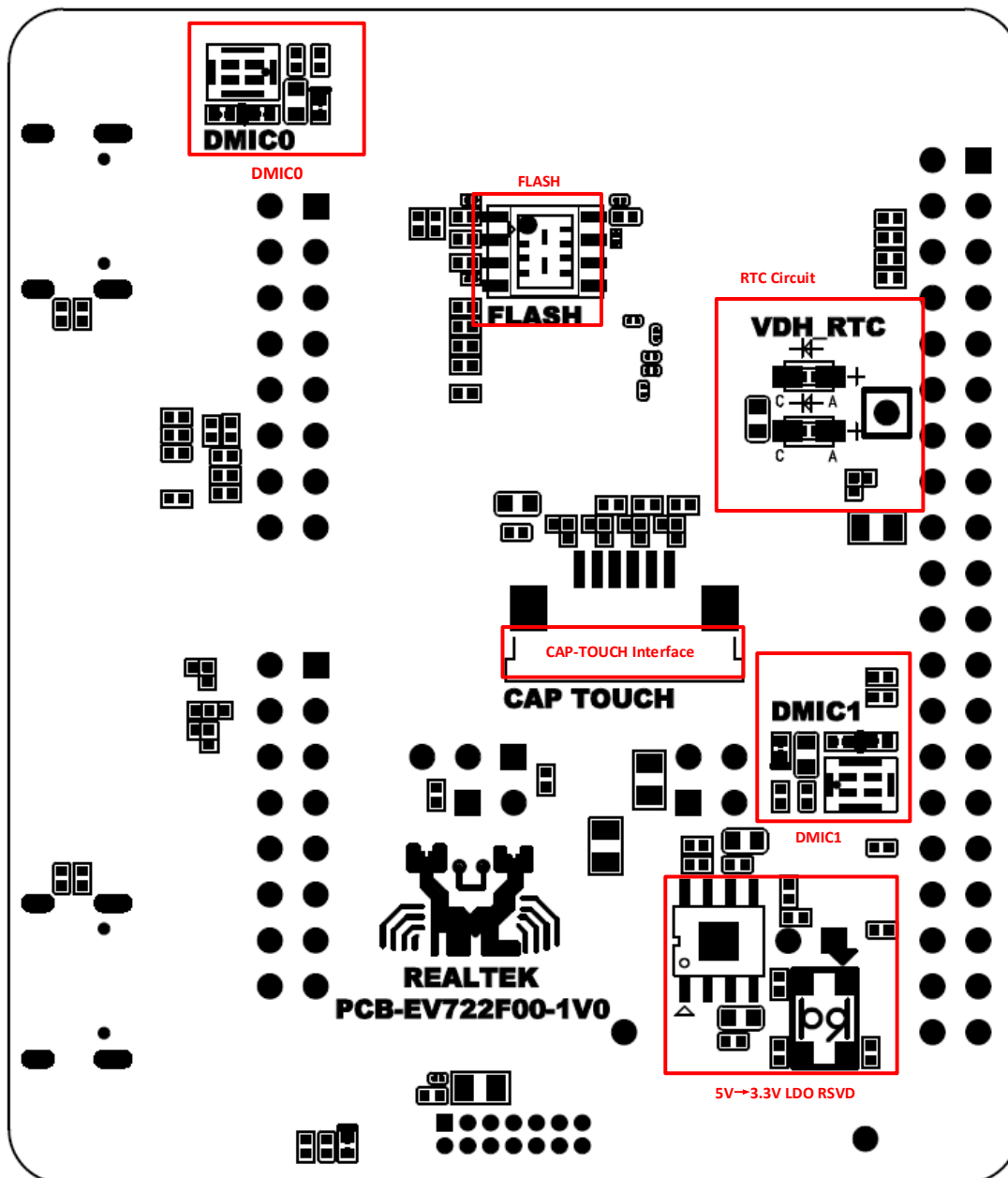


Figure 3-2 RTL8721DGF, RTL8721DGM, RTL8722FAM EVB – bottom layer

3.2 External Chips

3.2.1 External Flash

GD25WQ64ENEG of Giga-Device or W25Q32JVSNIQ of Winbond is used as an default external flash chip on the EVB.

The typical parameters of GD25WQ64ENEG are:

- High Speed Clock Frequency: 104MHz
- Full voltage range: 1.65-3.6V
- Operating temperature:-40°C-125°C
- Package: USON8 (3x4mm)

The typical parameters of W25Q32JVSNIQ are:

- High Speed Clock Frequency: 133MHz
- Full voltage range: 2.7V-3.6V
- Operating temperature:-40°C -105°C
- Package: SOP8 (150mil)

i NOTE

- Except for GD25WQ64ENEG and W25Q32JVSJQ, other flash chips of SOP8 (150mil) or USON8 (3x4mm) package can also be used on the EVB based on different application requirements.

3.2.2 Crystal

E1SB40E00090FE crystal of HOSONIC Technology is used as a high-precision clock source with an oscillation frequency of 40MHz with an operating temperature of -40°C ~ +105°C.

3.2.3 USB to UART converter

PL2303G4FIG7P2 of Prolific is used as a USB to UART converter. A USB-A/USB-C to USB-C cable can be used to connect the PC to the EVB and communicate with the RTL8721DGF, RTL8721DGM, and RTL8722FAM.

3.2.4 Microphone

There are two digital microphone chips on the EVB. Refer to Figure 3-1 for the location on the EVB.

The model number of DMIC is 3SM222FMT1KA, and the typical parameters are:

- Sensitivity: -26dB $\pm$ 1dB @ 94dB SPL 1kHz
- Signal-to-noise ratio (SNR): 60dBA
- Input clock frequency range:1-3.25MHz

3.2.5 Audio Amplifier

REALTEK's high performance mono class-D audio amplifier (ALC1019) is used as the driver of external speakers. It can deliver 3W/CH output power into 4 Ω speaker impedance with 5V power supply at the condition of THD+N=10%.

3.2.6 RF Circuits

PCB WLAN antenna is designed as copper wire or copper foil on PCB to reduce its volume.

3.3 Connector

Multiple connectors are provided on the EVB for the expansion of different functions of the chip. The positions of different connectors on the EVB are shown in the figures below.

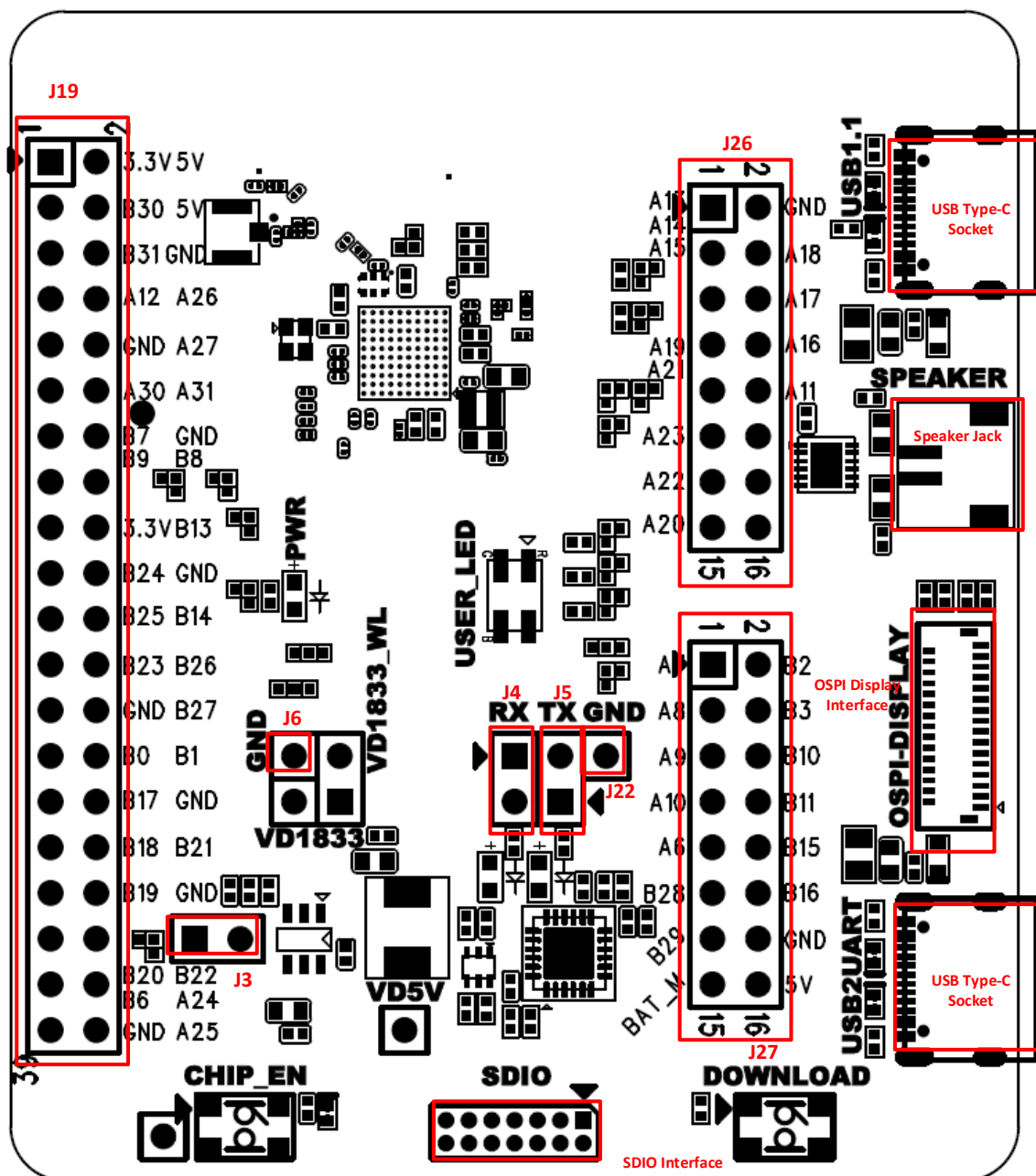


Figure 3-3 Connector top location diagram

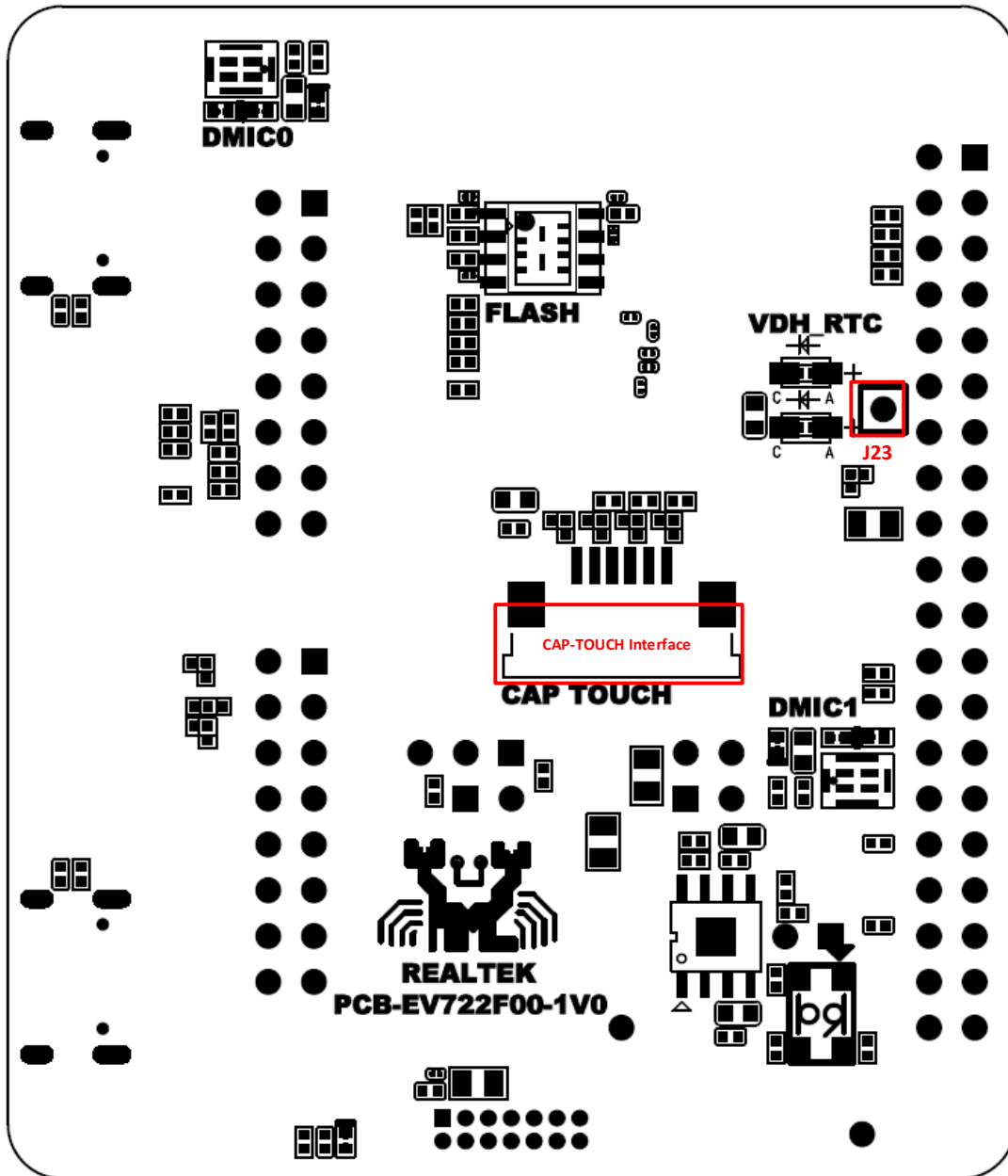


Figure 3-4 Connector bottom location diagram

NOTE

Only connectors with numbers and the names described next to them can be configured in the Figure 3-3. Other connectors with no specific purpose are used for internal test or other reserved functions. Please do not configure them arbitrarily to avoid affecting the normal operation of the chip.

3.3.1 Pin Headers

The pin multiplexing and description of each connector is listed in Table 3-1.

Table 3-1 RTL8721DGF, RTL8721DGM, RTL8722FAM EVB - pin headers

Designator	Pin number	Symbol	Description
J19	1	VD33	3.3V voltage supplied by 5V-to-3.3V or 1.8V DC-DC converter through R125 0 ohm resistor..
	2	VD5V	5V voltage supplied by USB interface.
	3	PB30	Used as GPIO or other functions connected to PB30 of RTL8721DGF, RTL8721DGM,

		RTL8722FAM directly.
4	VD5V	5V voltage supplied by USB interface.
5	PB31	Used as GPIO or other functions connected to PB31 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
6	GND	Ground.
7	PA_12	Used as GPIO or other functions connected to PA12 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R121 0 ohm resistor.
8	PA_26	Used as GPIO or other functions connected to PA26 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R47 0 ohm resistor.
9	GND	Ground
10	PA_27	Used as GPIO or other functions connected to PA27 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R51 0 ohm resistor.
11	PA_30	Used as GPIO or other functions connected to PA30 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R67 0 ohm resistor.
12	PA_31	Used as GPIO or other functions connected to PA31 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R76 0 ohm resistor.
13	PB_7	Used as GPIO or other functions connected to PB7 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R82 0 ohm resistor.
14	GND	Ground.
15	PB_9	Used as GPIO or other functions connected to PB9 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R116 0 ohm resistor.
16	PB_8	Used as GPIO or other functions connected to PB8 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R113 0 ohm resistor.
17	VD33	3.3V voltage supplied by 5V-to-3.3V DC-DC converter.
18	PB_13	Used as GPIO or other functions connected to PB13 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R52 0 ohm resistor.
19	PB24	Used as GPIO or other functions connected to PB24 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
20	GND	Ground.
21	PB25	Used as GPIO or other functions connected to PB25 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
22	PB_14	Used as GPIO or other functions connected to PB14 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R56 0 ohm resistor.
23	PB23	Used as GPIO or other functions connected to PB23 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
24	PB26	Used as GPIO or other functions connected to PB26 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
25	GND	Ground
26	PB27	Used as GPIO or other functions connected to PB27 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
27	PB_0	Used as GPIO or other functions connected to PB0 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R328 0 ohm resistor.
28	PB1	Used as GPIO or other functions connected to PB1 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
29	PB_17	Used as GPIO or other functions connected to PB17 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R72 0 ohm resistor.
30	GND	Ground.
31	PB_18	Used as GPIO or other functions connected to PB18 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R81 0 ohm resistor.
32	PB_21	Used as GPIO or other functions connected to PB21 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R46 0 ohm resistor.
33	PB_19	Used as GPIO or other functions connected to PB19 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R89 0 ohm resistor.
34	GND	Ground
35	PB_20	Used as GPIO or other functions connected to PB20 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R39 0 ohm resistor.
36	PB22	Used as GPIO or other functions connected to PB22 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
37	PB_6	Used as GPIO or other functions connected to PB6 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R74 0 ohm resistor.

	38	PA_24	Used as GPIO or other functions connected to PA24 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R55 0 ohm resistor.
	39	GND	Ground.
	40	PA25	Used as GPIO or other functions connected to PA25 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
J21	1	VCC_SDIO	Powered by SDIO host through R119 0 ohm resistor.
	2	GND	Ground.
	3	GND	Ground.
	4	PB_14	Used as GPIO or other functions connected to PB14 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R57 0 ohm resistor.
	5	PB_8	Used as GPIO or other functions connected to PB8 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R114 0 ohm resistor.
	6	GND	Ground.
	7	GND	Ground.
	8	PB_13	Used as GPIO or other functions connected to PB13 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R54 0 ohm resistor.
	9	PB_7	Used as GPIO or other functions connected to PB7 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R83 0 ohm resistor.
	10	GND	Ground.
	11	GND	Ground.
	12	PB_9	Used as GPIO or other functions connected to PB9 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R115 0 ohm resistor.
	13	PB_6	Used as GPIO or other functions connected to PB6 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R77 0 ohm resistor.
	14	GND	Ground.
J26	1	PA_13	Used as GPIO or other functions connected to PA13 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R59 0 ohm resistor.
	2	GND	Ground.
	3	PA_14	Used as GPIO or other functions connected to PA14 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R64 0 ohm resistor.
	4	PA_18	Used as GPIO or other functions connected to PA18 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R84 0 ohm resistor.
	5	PA_15	Used as GPIO or other functions connected to PA15 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R68 0 ohm resistor.
	6	PA_17	Used as GPIO or other functions connected to PA17 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R78 0 ohm resistor.
	7	PA_19	Used as GPIO or other functions connected to PA19 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R86 0 ohm resistor.
	8	PA_18	Used as GPIO or other functions connected to PA18 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R84 0 ohm resistor.
	9	PA_21	Used as GPIO or other functions connected to PA21 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R44 0 ohm resistor.
	10	PA11	Used as GPIO or other functions connected to PA11 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	11	PA_23	Used as GPIO or other functions connected to PA23 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R50 0 ohm resistor.
	12	I2S_BCLK	I2S output BCLK signal to audio PA by connecting J26.11 and J26.12.
	13	PA_22	Used as GPIO or other functions connected to PA22 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R48 0 ohm resistor.
	14	I2S_DOUT	I2S output data signal to audio PA by connecting J26.13 and J26.14.
	15	PA_20	Used as GPIO or other functions connected to PA20 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R88 0 ohm resistor.
	16	I2S_WS	I2S output WS signal to audio PA by connecting J26.15 and J26.16.
J27	1	PA7	Used as GPIO or other functions connected to PA7 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	2	PB_2	Used as GPIO or other functions connected to PB2 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R324 0 ohm resistor.
	3	PA8	Used as GPIO or other functions connected to PA8 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	4	PB_3	Used as GPIO or other functions connected to PB3 of RTL8721DGF, RTL8721DGM,

			RTL8722FAM through R326 0 ohm resistor.
	5	PA9	Used as GPIO or other functions connected to PA9 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	6	PB_10	Used as GPIO or other functions connected to PB10 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R314 0 ohm resistor.
	7	PA10	Used as GPIO or other functions connected to PA10 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	8	PB_11	Used as GPIO or other functions connected to PB11 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R316 0 ohm resistor.
	9	PA6	Used as GPIO or other functions connected to PA6 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	10	PB15	Used as GPIO or other functions connected to PB15 of RTL8721DGF, RTL8721DGM, RTL8722FAM directly.
	11	PB_28	Used as GPIO or other functions connected to PB28 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R321 0 ohm resistor.
	12	PB_16	Used as GPIO or other functions connected to PB16 of RTL8721DGF, RTL8721DGM, RTL8722FAM through R66 0 ohm resistor.
	13	POR_TH	Por threshold selection input pin.(Only effective in B-cut and newer version)
	14	GND	Ground.
	15	BAT_MEAS	BAT_MEAS voltage measurements input pin.(Input voltage range 0-5V)
	16	VD5V	5V voltage supplied by USB interface.
J3	1	FB	FB pin of DC-DC chip (Switching 3.3V output to 1.8V output of DC-DC by disconnecting J3.1 and J3.2 and removing R14 0 ohm resistor
	2	GND	Ground.
J4	1	UART_LOG_RX	UART RX signal of PL2303G4FIG7P2 RS232.
	2	PB_4	Default LOGUART RX function of RTL8721DGF, RTL8721DGM, RTL8722FAM.
J5	1	UART_LOG_TX	UART RX signal of PL2303G4FIG7P2 RS232.
	2	PB_5	Default LOGUART TX function of RTL8721DGF, RTL8721DGM, RTL8722FAM.
J6	1	GND	Ground.
J22	1	GND	Ground.
J23	1	VDH_RTC	Power from battery for RTC. When using external power for this pin, users need to remove R136 and solder R137.
J12	1	OUT_P	Positive output pin of audio amplifier.
	2	OUT_N	Negative output pin of audio amplifier.
	3	GND	Ground.
	4	GND	Ground.

NOTE

1. PA6, PA7, PA8, PA9, PA10, PA11 are not connected to any pin headers on EVB in RTL8721DGM, RTL8722FAM. Only RTL8721DGF can use these pins.
2. Not all GPIOs are connected to the pin headers. If the following GPIOs(PA13~18) need to be used on the pin headers, please refer to Table 3-2 to determine the hardware changes that need to be made on the EVB board. In addition, please refer to Figure 3-1 and Figure 3-2 for the specific location of the components that need to be adjusted on the board.

Table 3-2 Circuit modification instructions of GPIO

Pin name	Resistors need to be soldered	Resistors need to be removed	Note
PA13	R59 (0 ohm)	-	
PA14	R64 (0 ohm)	-	
PA15	R68 (0 ohm)	-	
PA16	R73 (0 ohm)	-	
PA17	R78 (0 ohm)	-	
PA18	R84 (0 ohm)	-	

3.3.2 USB-C socket

A standard USB-C socket is provided on the EVB. Users can use a USB-A/USB-C to USB-C cable to connect between PC and EVB for both power supply and LOGUART function.



Figure 3-5 USB-A to USB-C cable



Figure 3-6 USB-C to USB-C cable

3.3.3 OSPI Display Interface

EVB has an OSPI Display interface integrated with touch I2C interface, which can be connected with a display panel through FPC.

- The OSPI display interface consists of a clock line (SPI_CLK), a chip select line (SPI_CS), a data/command switching line (SPI_DCX) and 8 data lines (SPI_D0-SPI_D7). In addition, there are IM0/1, RESET, BLEN, 1.8V/3.3V power supply (VD1833), and 5V power supply (VDD5) for extended use.
- The touch function (TP_SCL, TP_SDA, TP_INT and TP_RST) interacts with RTL8721DGF, RTL8721DGM, and RTL8722FAM through I2C protocol.

The features of OSPI display interface are as followed:

- Max 50MHz clock rate.
- Support SPI, dual SPI, Quad SPI and Octal SPI
- Support SPI mode 0 and mode 3
- Support SDR and DDR mode

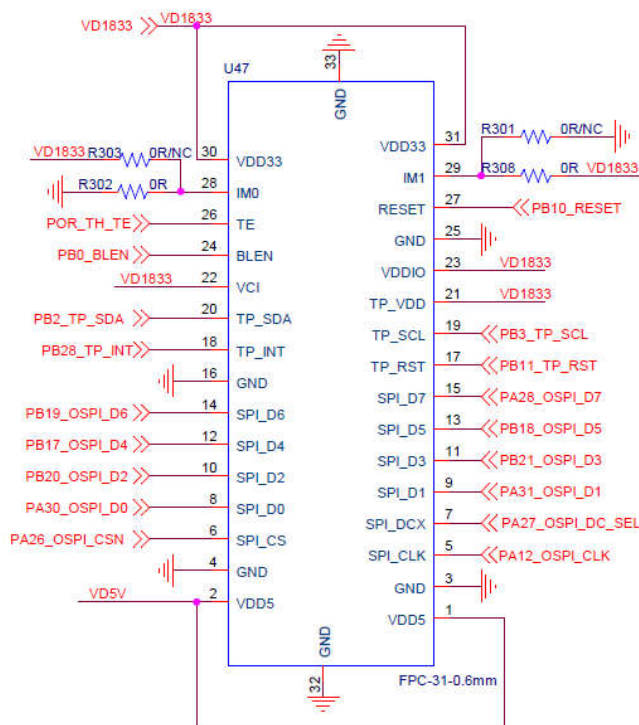


Figure 3-7 FPC signal distribution of display and touch interface

NOTE

When using, the cable should be carefully inserted into the connector to avoid damage to the golden finger.

3.3.4 IPEX

IPEX is reserved for Wi-Fi RF on the EVB. The IPEX female connector can be connected to an external antenna or an instrument to measure the RF characteristics.

Before using Wi-Fi RF function, please follow the instructions below:

- If users want to use external antenna, R92 0 ohm resistor should be removed and R91 0 ohm resistor should be soldered.
- If users want to use Wi-Fi PCB antenna, R91 0 ohm resistor should be removed and R92 0 ohm resistor should be soldered.

Figure 3-8 shows the size of IPEX female connector. Pay attention to the size matching of the adapter when using it.

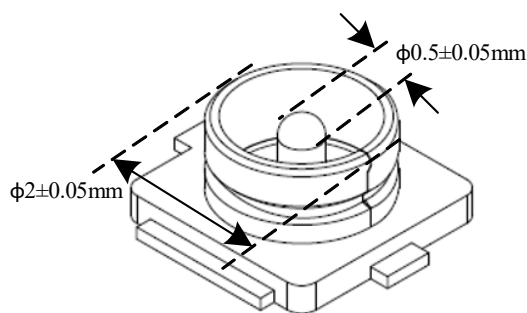


Figure 3-8 Size of IPEX female connector

3.3.5 Cap-touch Interface

A Cap-touch interface is provided on the EVB for extended use connected to a touch panel through FPC.

3.3.6 Speaker Jack

The speaker jack provided on the EVB is a 2-pin jack with a spacing of 1.5mm, connected with the P/N output of the power amplifier.

3.3.7 SDIO Interface

A SDIO interface is provided on the RTL8721DGF, RTL8721DGM, RTL8722FAM EVB which can be connected to a SDIO daughter board provided by connectors. The golden fingers of the daughter board can be inserted into the SDIO host like a PC for communication

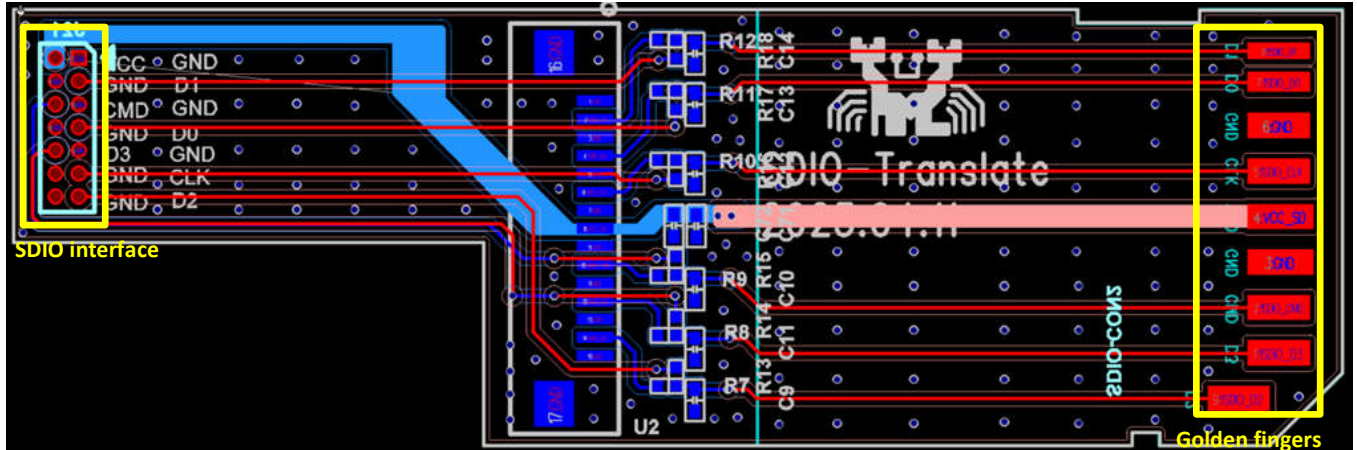


Figure 3-9 SDIO daughter board

4 Basic Usage

4.1 Power Supply

4.1.1 USB Power

The RTL8721DGF, RTL8721DGM, RTL8722FAM EVB can be powered by connecting PC or adaptor to either of the two USB-C sockets.

NOTE

- The maximum theoretical power supply capacity of general USB-A 2.0 port is 500mA which is enough for the EVB without Audio function under operation. If Audio function is needed, please use a USB-C to USB-C cable and make sure the power source is enough for the consumption of EVB.
- If users want to drive a speaker of greater power through ALC1019, please refer to the section 3.2.5 for detailed usage.

4.1.2 LED Indicators

A single color LED is used to indicate whether 3.3V or 1.8V power supply of RTL8721DGF, RTL8721DGM, and RTL8722FAM is available. Please refer to Figure 3-1 for the location of LED.

4.2 Reset

When the power supply is stable, RTL8721DGF, RTL8721DGM, RTL8722FAM can be reset by pressing and releasing the CHIP_EN button on the EVB, or powering the EVB off and then powering on.

The CHIP_EN button on the EVB is J14.

4.3 Communication

4.3.1 LOGUART

The RTL8721DGF, RTL8721DGM, RTL8722FAM EVB integrates a USB to UART chip so users can simply use a USB-A/USB-C to USB-C cable to connect EVB and PC. After that, users can communicate with RTL8721DGF, RTL8721DGM, and RTL8722FAM through any serial tool on the PC.

Before using the serial tool, users should follow the below steps:

- (1) Select the correct serial port.
- (2) Configure the transmission baud rate and frame format.
- (3) Open the serial port to interact with the EVB.

NOTE

The default transmission baud rate of LOGUART is 1.5Mbps

Take Trace Tool provided by REALTEK as an example, after the configurations above, the log window of the Trace Tool will display the data received/transmitted by PC and parse it into ASCII characters. Each line will display the time of receiving/transmitting this log.

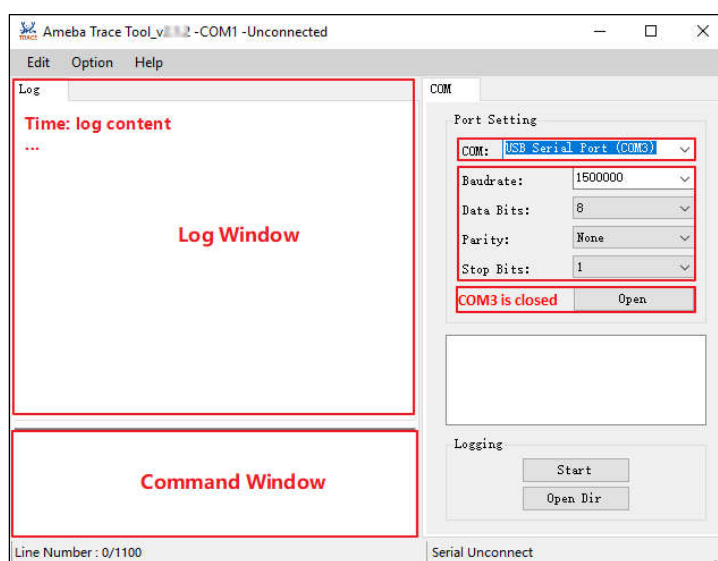


Figure 4-1 Trace Tool UI

4.3.2 SWD

RTL8721DGF, RTL8721DGM, RTL8722FAM supports 2-pins serial-wire debug (SWD) interface for users to access ARM Cortex®-M core integrated in the chip. For more information, please refer to ARM Debug Interface v6 Architecture Specification.

The default SWD function is distributed on PA30 (SWD_CLK) and PA31 (SWD_DAT).

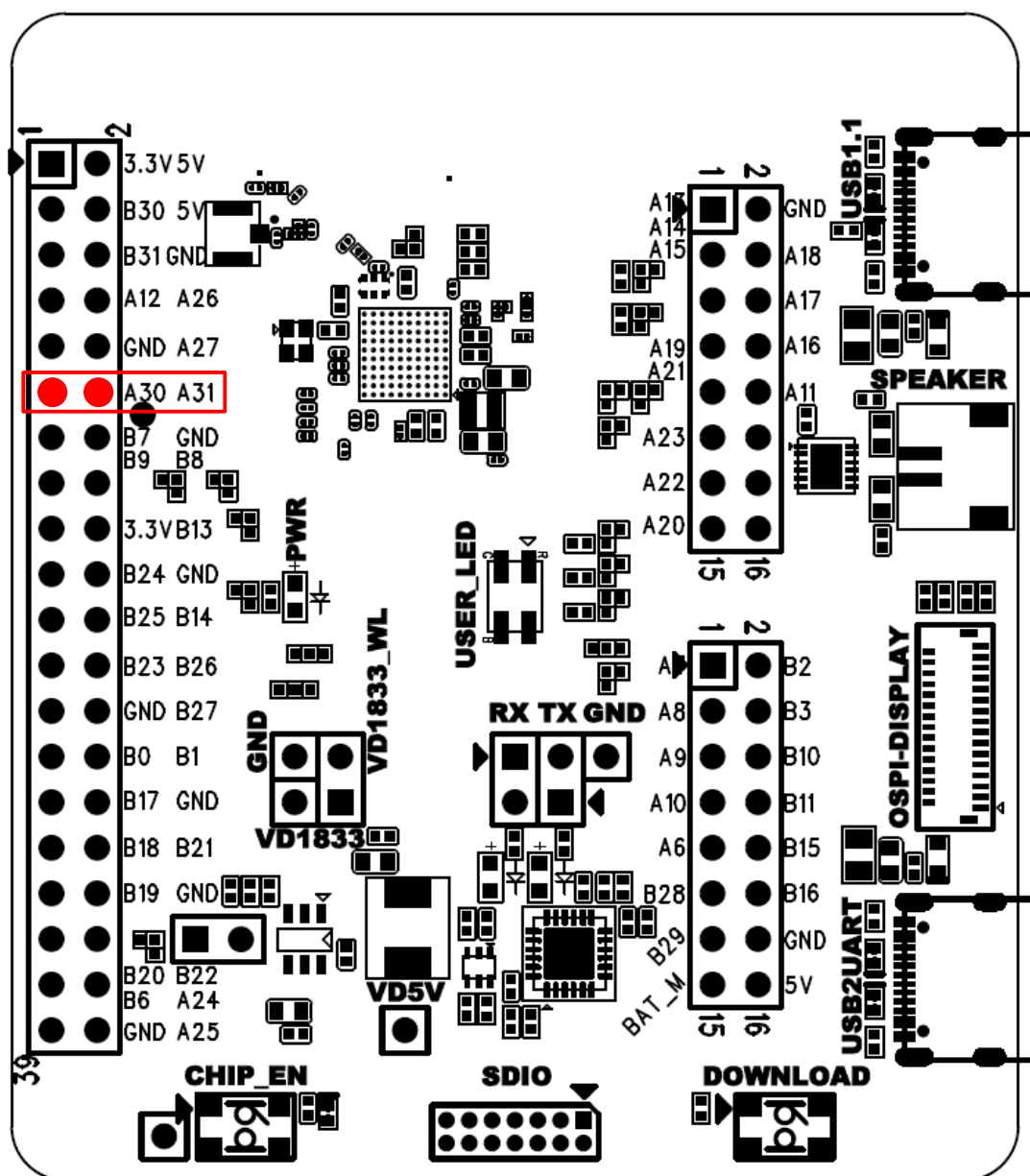


Figure 4-2 Location of SWD function on EVB

4.4 Wi-Fi

RTL8721DGF, RTL8721DGM, RTL8722FAM supports up to Wi-Fi 802.11n protocol and external antenna.

4.5 USB

RTL8721DGF, RTL8721DGM, RTL8722FAM supports up to USB protocol 2.0.

4.6 SDIO

RTL8721DGF, RTL8721DGM, RTL8722FAM supports up to SDIO card specification version 2.0.

NOTE

If users want to use SDIO interface (refer to chapter 3.3.7) on the EVB and related SDIO daughter board provided by REALTEK, please make the modifications in the Table 4-1. In addition, please refer to Figure 3-1 and Figure 3-2 for the specific location of the components that

need to be adjusted on the board.

Table 4-1 Circuit modification instructions of SDIO

Pin name	Function name	Resistors need to be soldered	Resistors need to be removed	Note
J21-4	SDIO_D1	R57 (0 ohm)	R56 (0 ohm)	
J21-5	SDIO_CMD	R114 (0 ohm)	R113 (0 ohm)	
J21-8	SDIO_D0	R54 (0 ohm)	R52 (0 ohm)	
J21-9	SDIO_D3	R83 (0 ohm)	R82 (0 ohm)	
J21-12	SDIO_CLK	R115 (0 ohm)	R116 (0 ohm)	
J21-13	SDIO_D2	R77 (0 ohm)	R74 (0 ohm)	

4.7 OSPI

RTL8721DGF, RTL8721DGM, RTL8722FAM supports OSPI Display Interface which includes one clock line and eight data lines.

NOTE

If users want to use OSPI interface (refer to chapter 3.3.3) on the EVB, please make the modifications in the Table 4-2. In addition, please refer to Figure 3-1 and Figure 3-2 for the specific location of the components that need to be adjusted on the board.

Table 4-2 Circuit modification instructions of OSPI

Pin name	Function name	Resistors need to be soldered	Resistors need to be removed	Note
U47-7	OSPI_DC_SEL	R34 (0 ohm)	R51 (0 ohm)	After R37 is soldered, OSPI circuits and USB circuits (CON2) on board cannot be used at the same time.
U47-6	OSPI_CSN	R41 (0 ohm)	R47 (0 ohm)	
U47-5	OSPI_CLK	R120 (0 ohm)	R121 (0 ohm)	
U47-8	OSPI_D0	R62 (0 ohm)	R67 (0 ohm)	
U47-9	OSPI_D1	R71 (0 ohm)	R76 (0 ohm)	
U47-10	OSPI_D2	R36 (0 ohm)	R39 (0 ohm)	
U47-11	OSPI_D3	R43 (0 ohm)	R46 (0 ohm)	
U47-12	OSPI_D4	R69 (0 ohm)	R72 (0 ohm)	
U47-13	OSPI_D5	R75 (0 ohm)	R81 (0 ohm)	
U47-14	OSPI_D6	R85 (0 ohm)	R89 (0 ohm)	
U47-15	OSPI_D7	R37 (0 ohm)	-	
U47-17	TP_RST	R317 (0 ohm)	R316 (0 ohm)	
U47-18	TP_INT	R320 (0 ohm)	R321 (0 ohm)	
U47-19	TP_SCL	R327 (0 ohm)	R326 (0 ohm)	
U47-20	TP_SDA	R325 (0 ohm)	R324 (0 ohm)	
U47-24	BLEN	R329 (0 ohm)	R328 (0 ohm)	
U47-26	TE	R322 (0 ohm)	R323 (0 ohm)	
U47-27	RESET	R315 (0 ohm)	R314 (0 ohm)	

4.8 Microphone

The RTL8721DGF, RTL8721DGM, RTL8722FAM can collect sound data through DMIC.

NOTE

If users want to use DMIC (refer to chapter 3.2.4) on the EVB, please make the modifications in the Table 4-1. In addition, please refer to Figure 3-1 and Figure 3-2 for the specific location of the components that need to be adjusted on the board.

Table 4-1 Circuit modification instructions of DMIC

Pin name	Function name	Resistors need to be soldered	Resistors need to be removed	Note
J21-4	SDIO_D1	R57 (0 ohm)	R56 (0 ohm)	
J21-5	SDIO_CMD	R114 (0 ohm)	R113 (0 ohm)	
J21-8	SDIO_D0	R54 (0 ohm)	R52 (0 ohm)	
J21-9	SDIO_D3	R83 (0 ohm)	R82 (0 ohm)	
J21-12	SDIO_CLK	R115 (0 ohm)	R116 (0 ohm)	
J21-13	SDIO_D2	R77 (0 ohm)	R74 (0 ohm)	

The RTL8721DGF, RTL8721DGM, RTL8722FAM can directly drive 4/8Ω impedance speaker with maximum power of 15W through AD52058.

A RGB LED and related driving circuit are provided on the EVB for free use. Users can set related pins to GPIO output mode and drive pins to low which connected to the LEDR/LEDG/LEDB ports to control the LED to emit red/green/blue colors of light. For further use, users can set related pins of RTL8721DGF, RTL8721DGM, and RTL8722FAM to PWM function to obtain more display color combinations.

NOTE

If users want to use USER LED circuit on the EVB, please solder on R331, R332 and R333 of at least 470 ohm resistors (Used as current limit resistors to prevent LED from being damaged).

The RTL8721DGF, RTL8721DGM, RTL8722FAM has many other functions such as SPI, I2C, I2S, ADC, PWM, etc., which can be expanded and used through the pins drawn by the connector. Please refer to the content in Section 3.3.1 for the pins led out through the connector.

NOTE

For all the contents above, please refer to the datasheet (DS1001 or DS1002) for more detailed information.

The signal of 40 pin header on the EVB is compatible with Raspberry Pi 4 and Raspberry Pi 3.5. If users need to connect the EVB to the Raspberry Pi, users should remove the 40 pin header on the top layer of the EVB and then solder the 40 pin receptacle on the bottom layer of EVB.

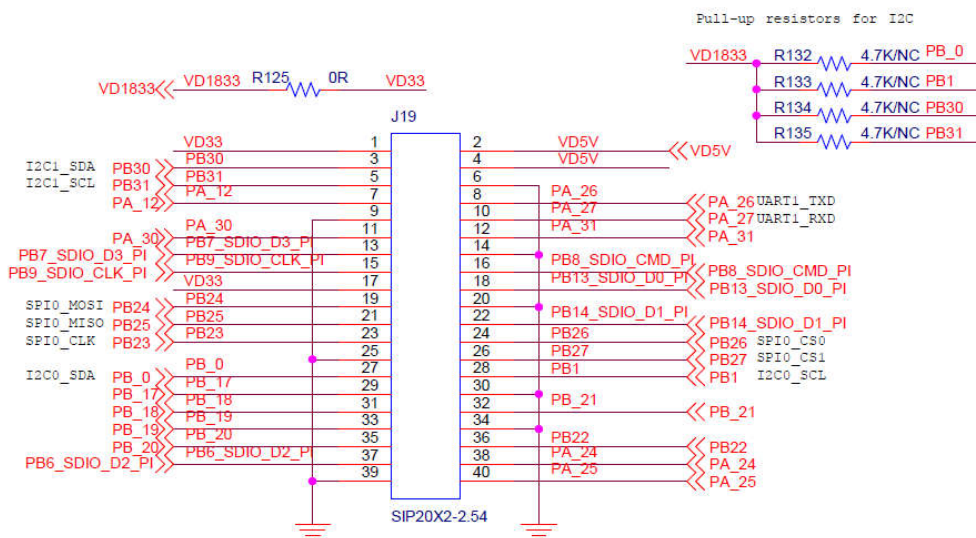


Figure 4-3 The 40 pin header on the EVB

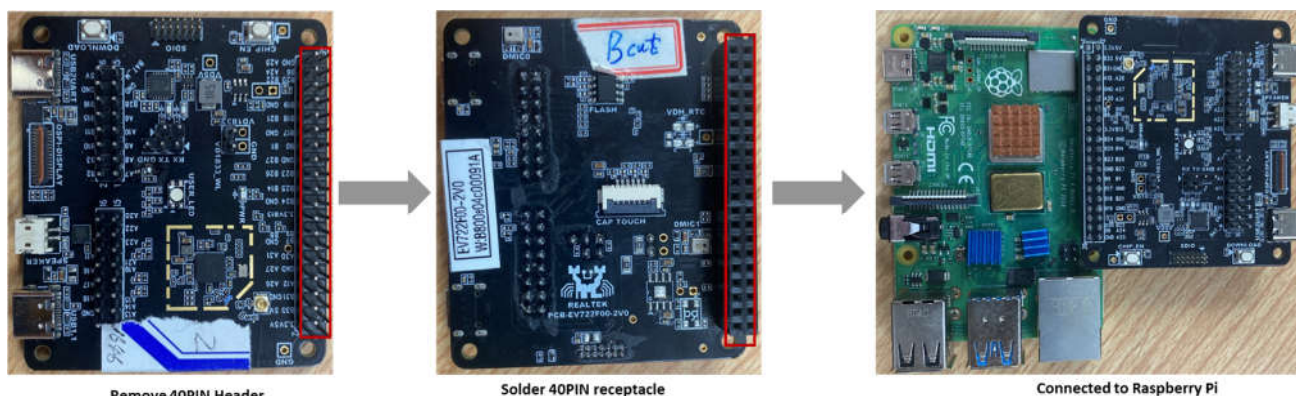


Figure 4-4 The operation of connecting EVB to Raspberry Pi

After connecting the EVB to the Raspberry Pi, the entire system needs to be powered on.

- If the EVB preforms as the slave, the system should be powered through the USB 5V (USB type-C on Raspberry Pi 4 and USB Micro-B on Raspberry Pi 3.5) on the Raspberry Pi. To avoid power conflicts, it is necessary to remove the resistor R1 from the top layer of the EVB and the resistor R330 from the bottom layer of the EVB. Users can debug the IC on the EVB through the USB-C (USB→UART) interface on the EVB.

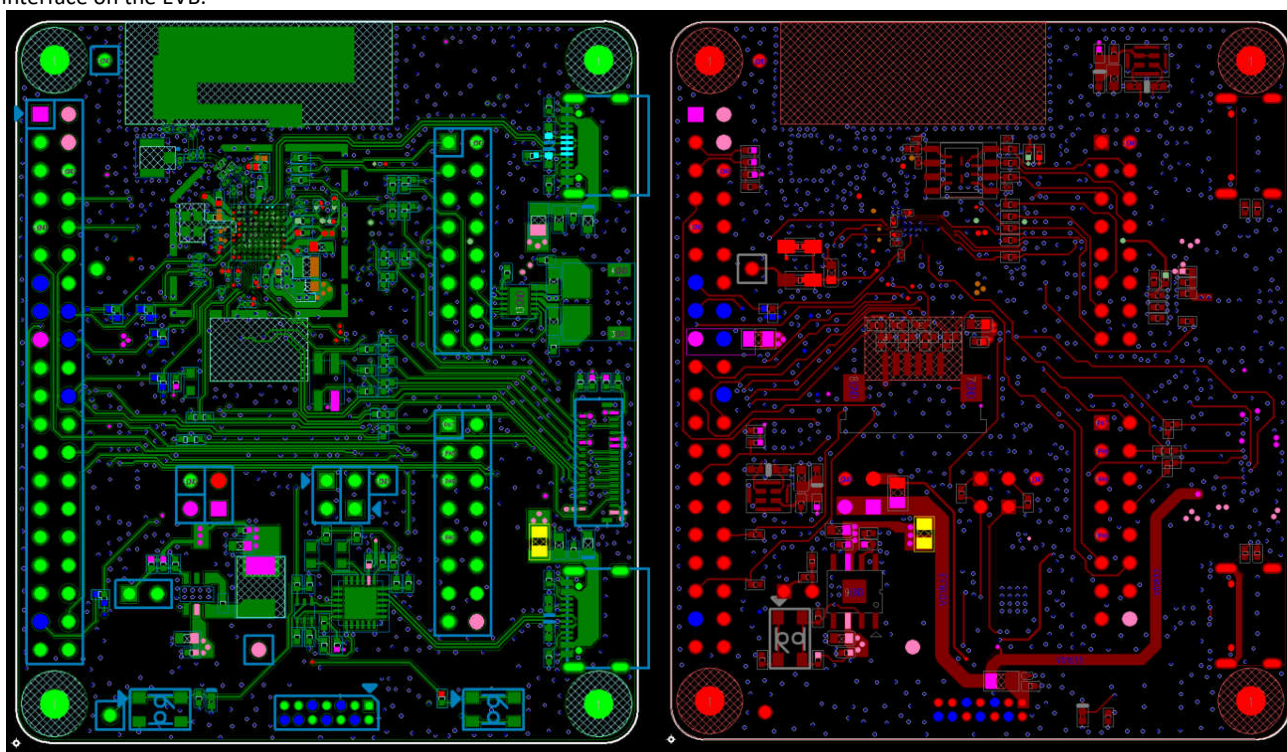


Figure 4-5 Location of resistors to be removed on EVB



Figure 4-6 Power supply method of the system when EVB preforms as slave

- If the EVB preforms as the master, the system should be powered through the USB-C 5V on the EVB. Users also can debug the IC on the EVB through the USB-C (USB→UART) interface on the EVB.

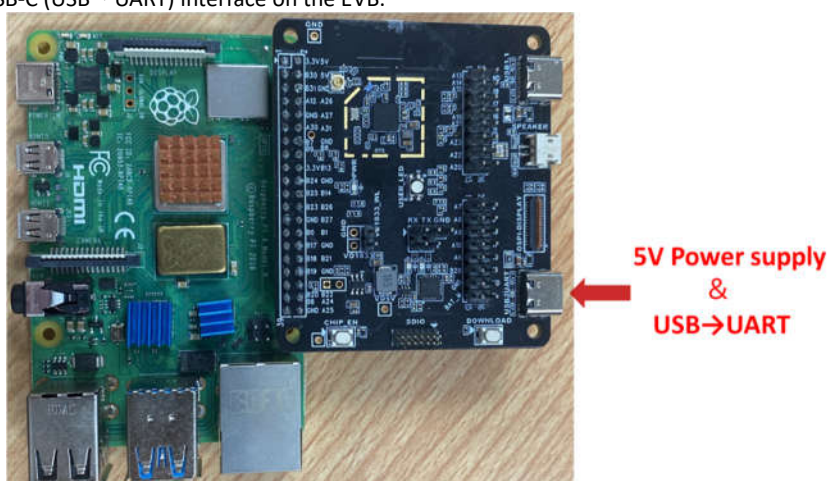


Figure 4-7 Power supply method of the system when EVB preforms as master

Revision History

Date	Version	Description
2023-07-03	v1.0	Initial release
2024-09-18	V1.1	Add sector 4.12