



MAVID-3M EVK

Hardware Guide

Revision: 0.1

Libre Wireless Technologies Private Limited

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1. Document Information

1.1. Abstract

This user guide shows how to get started with the MAVID-3M EVK.

1.2. Document Convention

Icon	Meaning	Description
	Note	Provides information good to know
	Caution	Indicates situation that might result in loss of data or hardware damage

1.3. Document Revision History

Revision	Date	Description of change	Author
0.1	April 20, 2021	Initial Draft	Shahim Ahmed, Chandravel

2. MAVID-3M EVK

Libre Wireless provides evaluation kits (EVK) for users to gain familiarity with our products and expedite their own design and development. User can connect to MAVID-3M module through UART to configure the module.

MAVID-3M EVK is a development platform for Libre's MAVID-3M module or solution. MAVID-3M is a unique voice, AI, IoT platform or module with Wi-Fi 2.4GHz, BLE 5.0, voice DSP (far field/near field detection, NR and AEC), application SoC and on-board RAM and Flash (4MB each).

MAVID-3M EVK is a sophisticated kit with UART, SPI, I2C and GPIOs peripherals pin out for developers to explore and implement their ideas in the area of AI, IoT and voice. This development kit comes with compilation tool chain, user guides, data sheet, API guides, Libre standard SDK with example applications for voice to device control (bulb control, appliances control, motor control, etc.), demo mobile App (Android and iOS) and support through FAQs. This makes the initial bring up and POC smoother for the developers.

2.1. MAVID-3M EVK Block Diagram

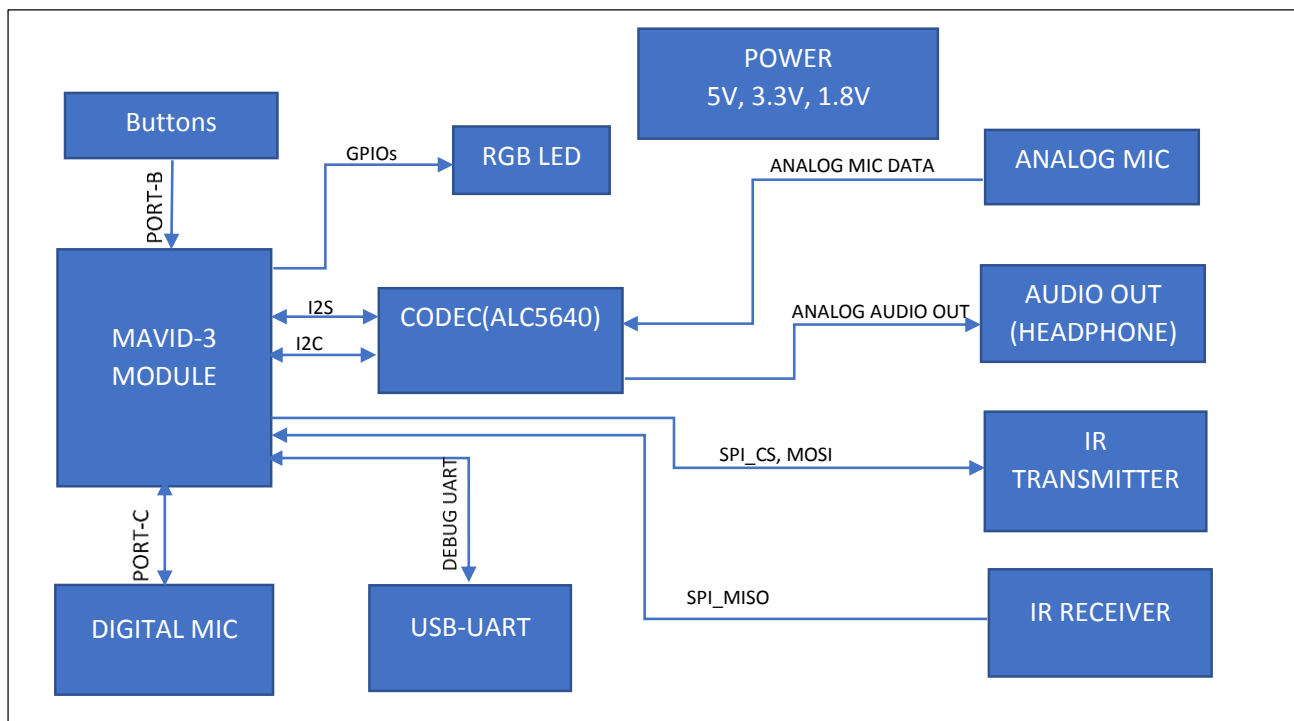


Figure 2.1: MAVID-3M EVK Block Diagram

2.2. MAVID-3M EVK Image

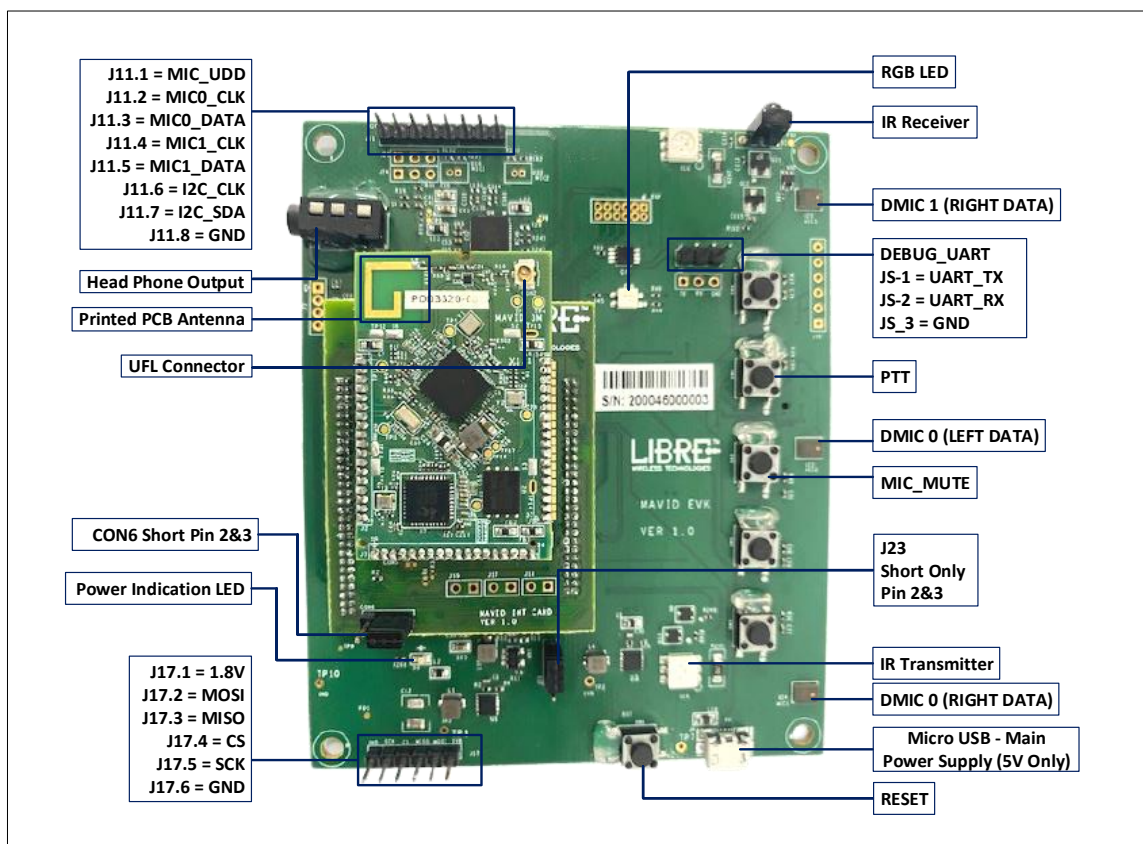


Figure 2.2: MAVID-3M EVK Image

2.3. What You Need

- MAVID-3M EVK
- 5V/2A power adapter
- Laptop Windows 8 or above/Linux
- Android or iOS mobile with Libre app
- Wi-Fi Router
- Remote
- Earphone or speaker with in-built speaker
- One Micro USB cable (+One optional)

2.4. Unboxing and Powering up MAVID-3M EVK

- a. MAVID-3M EVK Box contains 3 boards, namely MAVID-3M, Interconnect Card and EVK Board.

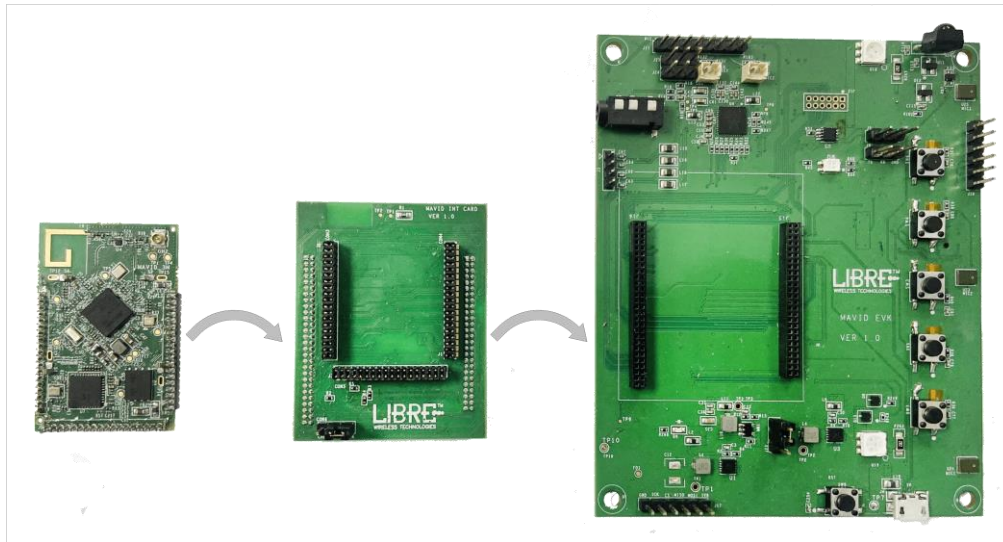


Figure 2.4-1: EVK Board Setup

- b. Connect all the 3 boards as shown in the below image to form a complete EVK board setup. Please take care while connecting the boards, do not offset any pins while connecting all the 3 boards into each other. Any offset may cause the improper function of MAVID-3M EVK or the whole setup can get damaged.



Figure 2.4-2: EVK Board Setup

- c. Power ON the board by supplying 5V adapter into the micro-USB connector (Power). If supplying by some external methods, do not exceed more than 5.5V or else it may damage the whole setup.
- d. Connect the micro-USB cable from laptop to USB-TTL connector provided in the box.
- e. PC requirements:
 - i. Windows 8 or above
 - ii. Linus/Ubuntu → Add the currently used Ubuntu OS version from software team.
- f. Audio Jack: Connect 3.5 mm Audio connector cable to listen the audio outs from Codec. Use earphone or speaker with in-built amplifier.
- g. Analog MIC: Connect Analog MICs to the MIC Connector when testing Analog MIC into the board, else the connector can be left empty.

2.4.1. Jumper Connections

1. In the EVK board

- a. DVDD_IO can be of 1.8V and 3.3V. To make the connection, follow the following connection:

Short pin number 1 and 2 of J23 by a jumper to get DVDD_IO = 3.3V

Short pin number 2 and 3 of J23 by a jumper to get DVDD_IO = 1.8V

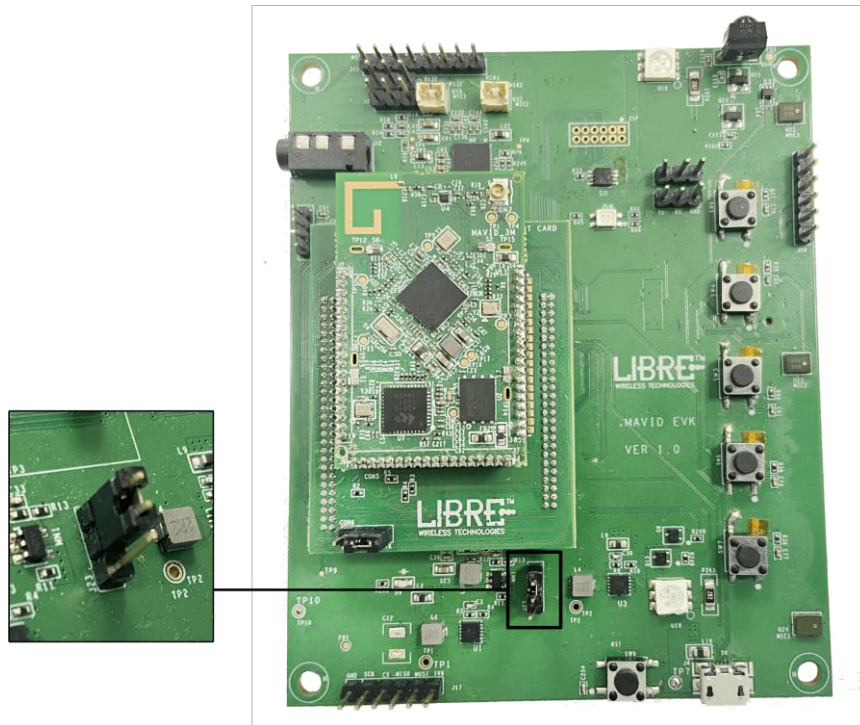


Figure 2.4.1-1: J23 Connector

- b. Acoustic Echo Cancellation (AEC) can be performed in two ways, one from MAVID-3M side and another from Codec side. To make AEC from Codec do the following jumper connections:

Short pin number 1 and 2 of J24 and short pin number 1 and 2 of J25 to get AEC Left and Right from Codec respectively.

If AEC done from MAVID-3M side above jumper connection is not required.

- c. For analog MIC connection only short pin number 2 and 3 of J24 and short pin number 2 and 3 of J25 to feed 2nd analog mic N & P to Codec respectively.

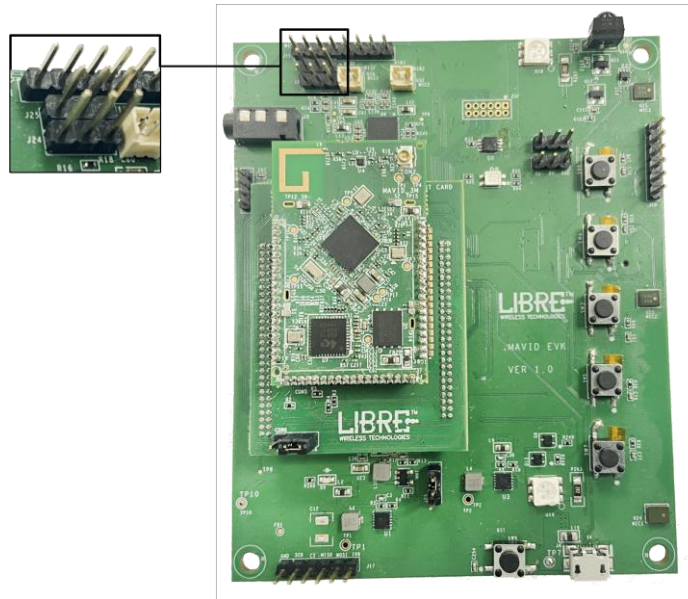


Figure 2.4.1-2: J24 and J25 Connector

2. In Interconnect card

- a. Short pin number 2 and 3 of CON6 to drive I2S_TXD from MediaTek

Short pin number 1 and 2 of CON6 to drive I2S_TXD from Knowles (Post Processed)

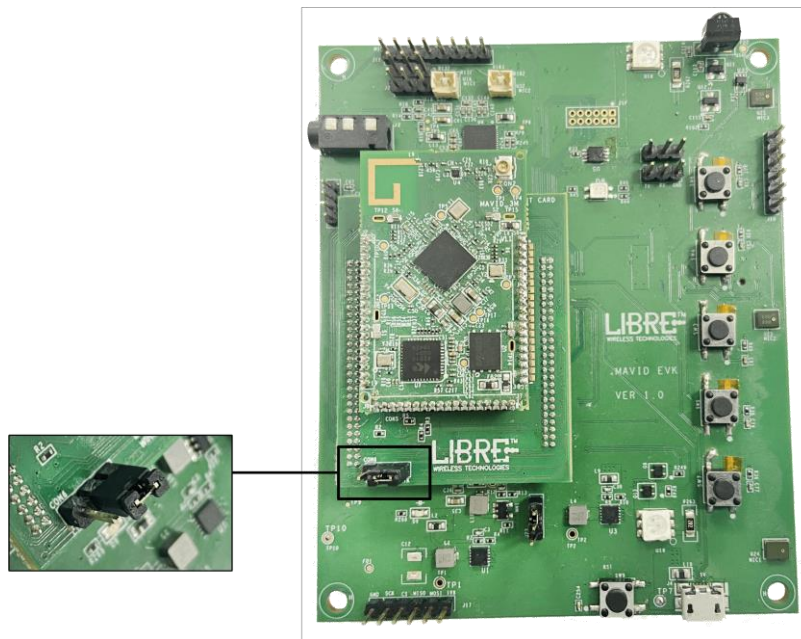


Figure 2.4.1-3: CON6 Connector

b. Only in case of Analog MIC

Short pin number 1 and 2 of J18 to connect LRCLK for I2S Format of Analog MIC Data

Short pin number 1 and 2 of J17 to connect BCLK for I2S Format of Analog MIC Data

Short pin number 1 and 2 of J19 to connect I2S Format of Analog MIC Data into Knowles

2.4.2. SPI Debug connector J17

Connector Pin	Signal
J17.1	1.8V
J17.2	SPI MOSI
J17.3	SPI MISO
J17.4	SPI CS
J17.5	SPI CLK
J17.6	GND

2.4.3. I2C and MIC Connector J11

Connector Pin	Signal
J11.1	MIC VDD
J11.2	DM0 CLK
J11.3	DM0 DAT
J11.4	DM1 CLK

Connector Pin	Signal
J11.5	DM1 DAT
J11.6	I2C SCL
J11.7	I2C SDA
J11.8	GND

2.4.4. UART Connector J5

Connector Pin	Signal
J5.1	TX
J5.2	RX
J5.3	GND

2.4.5. Class D Amplifier Connector

Connector Pin	Signal
J3.1	SPO_LP
J3.2	SPO_LN
J3.3	SPO_RN
J3.4	SPO_RP

2.5. MAVID-3M Module

- a. A module consists of 2 RF friendly connection i.e., Wi-Fi & BT (BLE) supports 20MHz, 40MHz bandwidth in 2.4GHz band.
- b. Contains 4MB NOR Flash memory for program storage.
- c. Provides I2S MCLK of 12.288MHz.
- d. Contains VOICE over DSP for POST PROCESSING of Filtered Audio data.
- e. MAVID-3M pinouts are as below:

Pin No.	Connection	Current Assigned
1	3.3V	3.3V
2	3.3V	3.3V
3	GPIO4_B	GPIO4_B
4	GND	GND
5	GPIO0_B	GPIO0_B
6	GPIO9_B	GPIO9_B
7	GPIO10_B	PWR_OFF
8	CHIP_EN	CHIP_EN
9	GPIO13_B	MIC_PWR_CTRL
10	GND	GND
11	I2S_MCLK	I2S_MCLK
12	PORTA_FS	I2S_LRCK
13	PORTA_FS	I2S_BCLK
14	PORTA_DI	PORTA_RXD
15	GPIO1	I2S_TXD
16	GPIO0	I2S_RXD
17	PORTA_DO	PORTA_TXD
18	GPIO14	SPI_MISO
19	GPIO16	SPI_CLK

Pin No.	Connection	Current Assigned
20	GPIO17	SPI_CS
21	GPIO15	SPI_MOSI
22	PORTB_FS	PTT/SETUP
23	PORTB_CLK	MIC_PWR_ON/OFF
24	PORTB_DI	CHG_STATUS
25	PORTB_DO	PLAY/PAUSE
26	GPIO_0(CHL)	GPIO_0(CHL)
27	GPIO_1(CHL)	GPIO_1(CHL)
28	PORTC_DO	PORTC_DO
29	PORTC_DI	PORTC_DI
30	PORTC_CLK	PORTC_CLK
31	PORTC_FS	PORTC_FS
32	COMMB_2	DSP_UART_TX
33	COMMB_3	DSP_UART_RX
34	GND	GND
35	COMMB_1	UART1_TX
36	COMMB_0	UART1_RX
37	GND	GND
38	NC	NC
39	1.8V	1.8V
40	VDD_IO	VDD_IO
41	VDD_IO	VDD_IO
42	GPIO1_B	LED_RED
43	GPIO15_B	LED_GREEN
44	GPIO18_B	LED_BLUE
45	RTC_EINT	RTC_EINT
46	GPIO14_B	CODEC_RST

Pin No.	Connection	Current Assigned
47	GPIO8_B	GPIO8_B
48	BTVBAT	BTVBAT
49	VRTC	VRTC
50	GND	GND
51	GPIO18	ADC1
52	GPIO5	I2C0_SCL
53	GPIO6	I2C1_SDA
54	GPIO19	DEBUG_UART_RX
55	GPIO20	DEBUG_UART_TX
56	GND	GND

2.5.1. Buck Converter 5V to 3.3V and 1.8V

- The board contains buck converters to convert 5V to 3.3V and 5V to 1.8V.
- Switching frequency and Max current achievable are 1.4MHz and 2A respectively.
- Limits input to 5.5V Max.

2.5.2. ALC CODEC

- 2 Analog to Digital Converter with 94dBA SNR.
- 2 Digital to Analog Converter with 100dBA SNR.
- 3 Differential ended Analog MIC inputs.
- 3 Analog Audio output paths i.e., 2 Differential Class D speaker, Headphone and Mono Output.



Mono Output and IN3P/IN3N shares the same pin.

- e. I2S channels with up to 16 bits of I2S data for MCLK 12.288MHZ.
- f. I2C communication with address 0x38 (Write), 0x39 (Read).

2.5.3. D8 RGB LED

State	LED Indication
Ready/Idle State	No Indication
Listening	Cyan
Thinking	Cyan and Blue - Alternating
Speaking	Cyan and Blue - Pulsing
Notification Arrives	Yellow - Burst
Notification Queued	Yellow - Slow Pulse
Microphones Mute	Red solid
Firmware Update	Solid Magenta
Booting up	White - blink
Wi-Fi Connected & Alexa not Connected	Green blinking
Wi-Fi setup mode	Multiple colors

2.5.4. Digital MICs

- a. MEMS microphone with 65Db (A) SNR with a low distortion of 2.9% at 115dB SPL and a flat frequency response between 20 – 20kHz.
- b. Max Supply = 3.6V, Max Clk freq = 4.8MHz.

2.5.5. Buttons functionality

Switch#	Short press Functionality	Long press Functionality	MAVID_3M PORT
SW3	PTT	SETUP	PORTB_FS
SW4	MUTE	Reboot	PORTB_CLK
SW5	Vol+	NA	PORTB_DI
SW6	Vol-	NA	PORTB_DO
SW7	Play/Pause	NA	NA

2.5.6. IR Transmitter & Receiver

- a. The IR Transmitter diode chip consist of 3 diodes which can be connected in series, parallel, series - parallel based on requirement.

Typical Forward voltage (Vf) = 1.35V for Forward Current (If) = 60mA. The diode can be worked for Vf = 4.8V and If = 3A provided Pulse width <= 100usec and Duty cycle <=1%.

- b. The IR transmitter diode on conducting has a wavelength of 940nm with bandwidth of 65nm.
- c. Viewing angle of IR Transmitter is up to 140°.
- d. IR Receiver receive all the IR signals in range of 20kHz - 60kHz. Supply voltage

typically, between 2.5V - 5.5V.

e. Transmission distance of IR Receiver is 1.8 m typical with the directivity of 45°.