MAVID-3M Datasheet

(Multi-protocol Audio Voice IoT Device)

Revision: 1.4

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Table of Contents

1. Document Revision History

Revision	Date	Description of change	Author
1.2	May 18, 2021	Added Ordering Information section	Chandravel
1.3	May 31, 2021	Updated MAVID 3M module image	Chandravel
1.4	July 07, 2021	Updated power numbers	Chandravel

2. Overview

Libre Wireless, MAVID-3M module is a low power module targeted for IoT, voice/AI and audio streaming applications. The efficient low power mode states enable MAVID-3M well suitable for portable battery powered devices.

The module provides 2.4 GHz Wi-Fi connectivity, BLE 5.0, Voice Front End with 2/3 MIC Far field Voice recognition, Noise reduction and Echo cancellation.

3. MAVID–3M Features and Spec

3.1 Generic Features

- ARM Cortex-M4 @ 192 MHz

- Open SDK Voice/AI, IoT, Audio on Free RTOS Operating System

- 1x UART (currently used for debugging)

- 2x SPI (QSPI for Flash, SPI for Voice Front End)

- 1x I2C

- Supports up to 16 GPIO's

- 1x I2S Serial audio interface

- Hi-Resolution Audio (up to 192 KHz/24 bits) stereo supported

- LPCM, MP3, HE-AAC decode capability

- Crypto Engine for AES 128, 192, 256. DES, 3DES, MD5, SHA-1,224,256,384,512, True Random number generator

- Two/three Mic Far Field voice. Noise reduction (Beam Forming) and AEC

- Up to three Digital MIC

- Internal 4MB SRAM

- External QSPI flash4MB (XIP)

- 1x1, 802.11n 2.4GHz WLAN

- BLE 5.0

- Wi-Fi/BLE coexistence

- Antenna diversity

- Requires multiple voltage domains (VBAT / 3.3 V and 1.8 V)

3.2   WLAN Features

- IEEE 802.11 b/g/n (2.4GHz, 1x1)

- Supports 20 Mhz,40 MHz bandwidth in 2.4 GHz band.

- Supports short GI and all data rates of 802.11n including MCS0 to MCS7

- Wi-Fi security WEP, WPA2, WPS

- Support Soft AP and sniffer modes

- Supports digital pre-distortion to enhance PA performance

- RX antenna diversity

- Integrated 2.4 GHz PA, LNA and T/R switch

- Single ended RFIO with integrated balun

- Supports an optional LNA and PA

- Dedicated high performance 32-bit RISC CPU up to 160 MHz clock to run WLAN firmware

3.3   Bluetooth Features

- Support BLE (Bluetooth Low Energy) 5.0

- Support BLE 1M, 2M and long range

- Support BLE extended advertising

- Support 8 data link connection

- Support 128bit AES

- Four PWM channels

- Integrates baseband, radio for Mesh Controllers, mobile payments and wearable device applications

- Ultra-low power consumption

3.4 Voice Front End Features

- Dual Core DSP (Cadence Tensilica based audio centric DSP core)

- Dedicated to run Wake Word, Noise Reduction (beam forming) and AEC algorithms as per requirement

- 2/3 MIC far field voice recognition

- Room to offload the main Application processor for dedicated tasks as per requirements

- Can support custom Wake words and Local commands in edge as per the requirements

- Will support digital sound processing capability for audio output path (e.g.: Equalizer, DRC)

- Low power, low-latency, and high-performance algorithm processing at the edge

- Xtensa HiFi 3 instruction sets enable extensive voice and audio capabilities including voice user interfacing and ambient sound processing

3.5 Platform Features

MAVID-3M comes with extensive software SDK features for Voice/AI, Audio and Multi-protocol IoT control applications. These include system level control and data transfer and bridging features as well as core networking connectivity and OTA features.

Below are the feature highlights for the MAVID-3M Device and please refer to the full "MAVID-3M Feature List" for details of supported features.

- Complete Low Power AVS "Mic-to-Cloud" Solution (Amazon AVS)

- 802.11n 1x1, BLE 5.0 complaint

- Network configuration using BLE and WI-FI direct

- Secure OTA Firmware Update

- IoT Stack for AWS or custom IoT Application, Device cloud for back end support

- Android and iOS Application for device on boarding and other functionalities

- Self-Hosting; no external MCU required

- Three Mic Far Field & Wake Word detection with AEC and Beamforming

- Hardware Crypto core + OTP

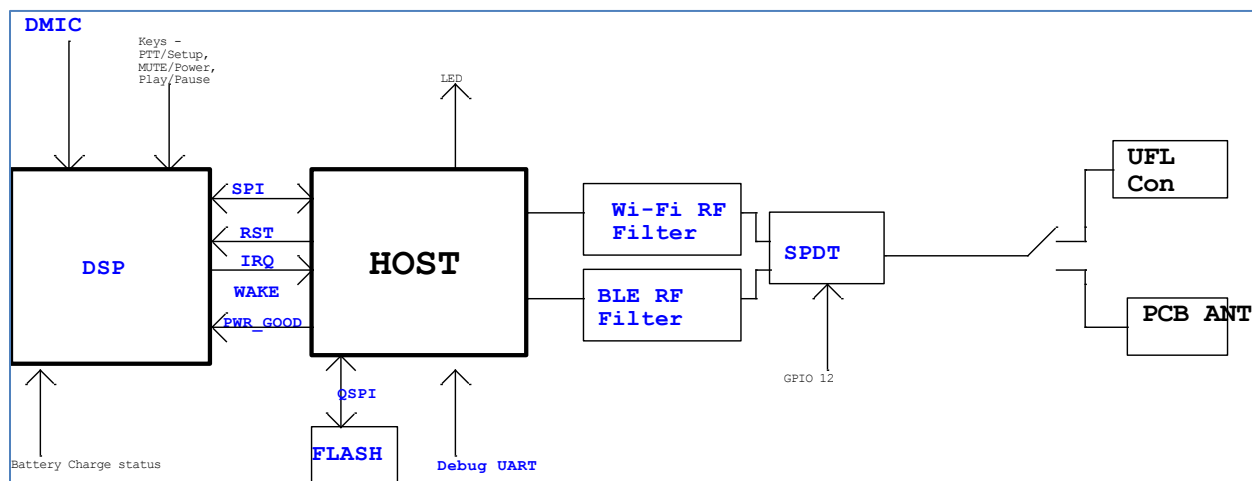- Advanced low power state & battery management

4. Block Diagram

Figure 4-1: MAVID–3M Block Diagram

5. MAVID-3M: Power modes and Consumption

Table 1: MAVID-3M Device Power Consumption

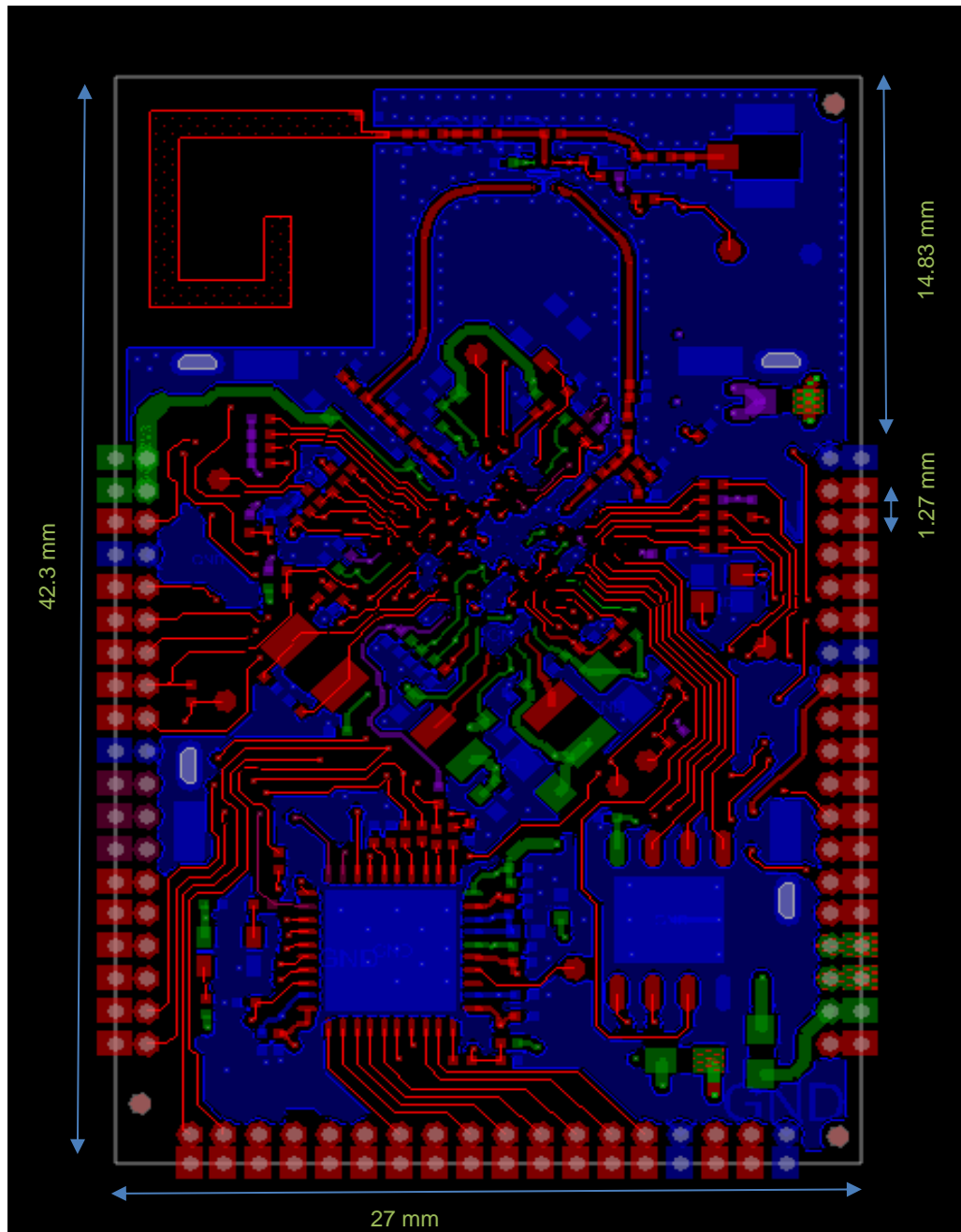| Input Voltage /Battery (v)	Sub System	Operating Mode	Response Time	Power (mW)
3.3	Active Wi-Fi Streaming from AVS cloud. Total consumption of Wi-Fi/BLE Concurrent, Voice DSP Noise Reduction & AEC	Active State	Always On, Immediate	183
3.3	Ideal Mode	Wi-Fi Connected but music is not streaming	Always On, Immediate	165

6. Package Information

Figure 6-1: MAVID–3M Module Mechanical Dimension

Figure 6-2: MAVID-3M Module
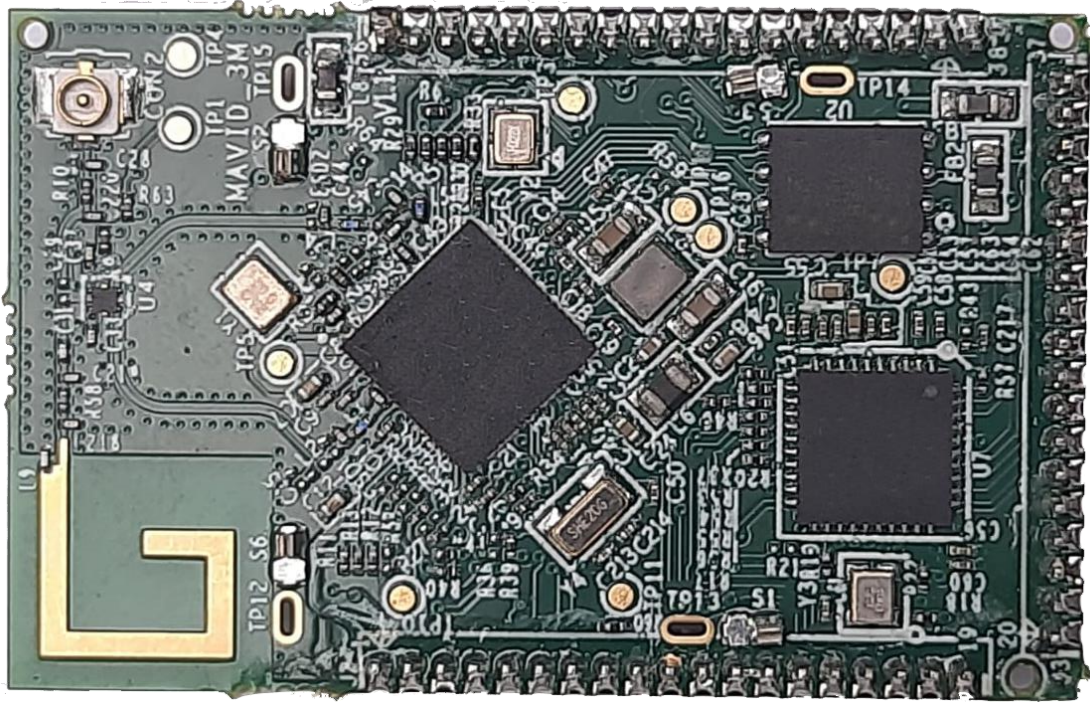
7. Ordering Information

Product Number	Main Processor	Wi-Fi Tx/Rx	Wi-Fi Bands	Bluetooth only BLE	Memory (Flash/ RAM)	Voice	Dimension (L x W) ±0.2mm
MXD31NS BKC - M	Yes	802.11n 1x1	2.4 GHz	BLE 5.0	4MB/ 4.4MB	Yes	27 mm x 43 mm
MXD31NSB00 - M	Yes	802.11n 1x1		BLE 5.0	4MB/ 4.4MB	No	

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8. Pin Description

Pin No.	Signal Name	Signal Type	Description
1	3V3	Power	3V3
2	3V3	Power	3V3
3	GPIO4_B	GPIO4_B	GPIO
4	GND	GND	GND
5	GPIO0_B	Output	GPO
6	GPIO9_B	Output	GPO
7	PWR_OFF	Output	For Power off circuit
8	CHIP_EN	Input	Chip reset
9	MIC_PWR_CTRL	Output	For Mic power control
10	GND	GND	GND
11	I2S_MCLK	Output	I2S Master Clock
12	I2S_LRCLK	Input/ Output	I2S LRCLK
13	I2S_BCLK	Input/ Output	I2S BCLK
14	PORTA_RXD	Input	AEC reference Data
15	I2S_TXD	Output	I2S data out
16	I2S_RXD	Input	I2S data in
17	I2S_PORTA_TXD	Output	Optional/Additional I2S data out
18	SPI_MISO	Input	SPI MISO
19	SPI_CLK	Output	SPI CLK
20	SPI_CS	Output	SPI CS
21	SPI_MOSI	Output	SPI MOSI

22	PTT/SETUP	Input/Output	Button PTT / Setup
23	MIC_PWR_ON/OFF	Input/Output	Button MIC / Power
24	CHG_STATUS	Input/Output	For Battery charging Indication
25	PLAY/PAUSE	Input/Output	Button Play / Pause
26	DSP_GPIO0	Input/Output	Knowles DSP GPIO
27	DSP_GPIO1	Input/Output	Knowles DSP GPIO
28	DM1_CLK	Output	Digital MIC Data
29	DM1_DATA	Input	Digital MIC Clock
30	DM0_CLK	Output	Digital MIC Clock
31	DM0_DATA	Input	Digital MIC Data
32	DSP_D_UART_TX	Output	Knowles DSP UART TX
33	DSP_D_UART_RX	Input	Knowles DSP UART RX
34	GND	GND	GND
35	UART1_TX	Output	UART1_TX
36	UART1_RX	Input	UART1_RX
37	GND	GND	GND
38	NC	NC	NC
39	1V8	Power	1.8V
40	VDD_IO	Power	To connect 3V3 or 1V8 to Knowles
41	VDD_IO	Power	To connect 3V3 or 1V8 to Knowles
42	LED_RED	Output	AVS LED_RED
43	LED_GREEN	Output	AVS LED_GREEN
44	LED_BLUE	Output	AVS LED_BLUE
45	RTC_EINT	Input	Real Time Clock External Interrupt

46	CODEC_RST	Output	To enable/disable EXT CODEC
47	GPIO8_B	Output	GPIO
48	BTVBAT	Power	3V3 Battery Input
49	VRTC	Power	Connect 3V coin battery
50	GND	GND	GND
51	ADC1	Analog	Analog
52	I2C0_SCL	Output	I2C SCL
53	I2C0_SDA	Input/Output	I2C SDA
54	DEBUG_URXD	Input	Debug log
55	DEBUG_UTXD	Output	Debug log
56	GND	GND	GND