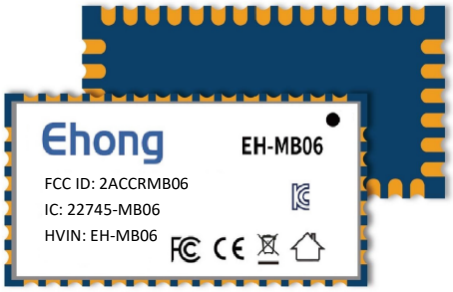
EH-MB06

Audio Module Data Sheet

EH-20211215-DS Rev1.3



- **Feature**

- Bluetooth® v5.1
- Bluetooth, Bluetooth low energy
- 120MHz Qualcomm® Kalimba™audio DSPs
- Dual core application subsystem 32 MHz operation
- Flexible QSPI flash programmable platform
- High-performance 24-bit stereo audio interface
- Digital and analog microphone interfaces
- SBC, and AAC audio codecs support
- Serial interfaces: UART, Bit Serializer (I^2C/SPI),USB 2.0
- 256K RAM,32M Flash

- **Application Subsystem**

- Dual core application subsystem 32 MHz operation
- 32-bit Firmware Processor:
- Reserved for system use
- Runs Bluetooth upper stack, profiles, house-keeping code
- 32-bit Developer Processor:Runs developer applications
- Both cores execute code from external flash memory using QSPI clocked at 32MHz
- On-chip caches per core allow for optimized performance and power
- consumption

- **User Interface**

- Send AT command over UART
- Firmware upgrade over USB
- PCM interface (I2S,SPDIF)
- I2C interface(Master)

- **General I/O**

- 13 general purpose I/Os
- 2 analogue I/O
- Three fully configurable LED drivers

- **Single voltage supply: 2.8-4.2V**
- **Small form factor: 23.24 x 11.93 x 2.2mm**
- **Operating temperature range: -40 °C to 85 °C**

Mar 1 2017

VERSION HISTORY

Version	Comment
V1.0	Current consumption added
V1.1	Addition RX and TX
V1.2	Add aptX model
V1.3	Add Block Diagram

Contents

1. Table of Tables

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1. Description

The EH-MB06 is an easy to use Bluetooth module, compliant with Bluetooth v5.1. The module provides complete RF platform in a small form factor.

The module enables electronic devices with wireless connectivity, not requiring any RF experience or expertise for integration into the final product. The module being a certified solution optimizes the time to market of the final application.

The module built-in enhanced Kalimba DSP coprocessor with 120MIPS, supports enhanced audio and DSP Applications (AAC, SBC codec, 1-Mic Qualcomm®cVc).Support GATT,A2DP, AVRCP, HSP, HFP,SPP, iAP and PBAP Profiles communication with smart ready devices.

2. Application

- Home entertainment eco-system
  - Smart remote controllers
  - Wired or wireless sound bars
  - Wired or wireless speakers and headphones
  - Bluetooth low energy connectivity to external 3D glasses
- Tablets / PCs / Mobile Connectivity
  - Wired or wireless headphones for music / gaming / multimedia content
  - Wired or wireless speakers
  - Mono Headsets for voice

3. EH-MB06 Product numbering

EH-MB06(C)

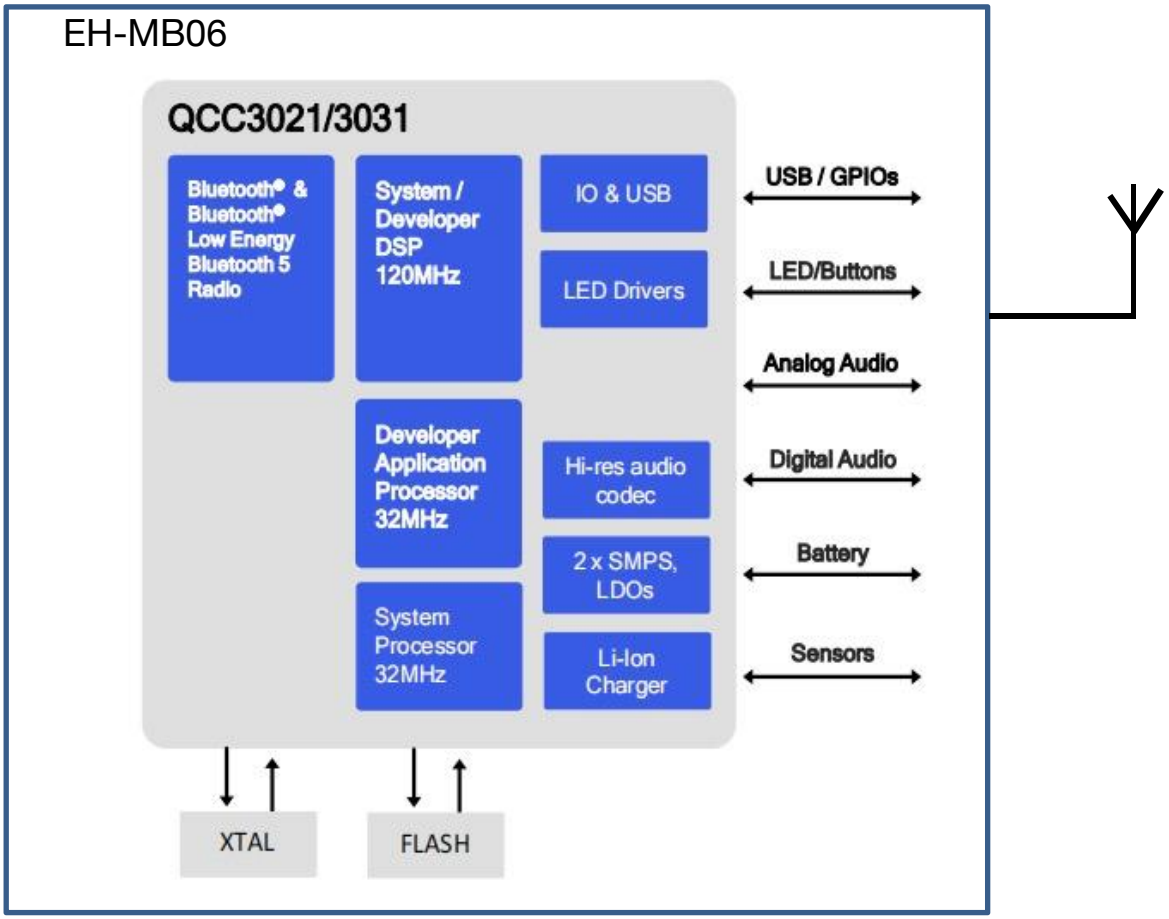
A. EH ---------- Company Name (Ehong)

B. MB06 ---------- Module Name

C. C ---------- support aptX

4. Electrical Characteristic

4.1. Block Diagram



4.2. Recommend operation conditions

Operating Condition	Min	Typical	Max	Unit
Operating Temperature Range	-40	--	+85	°C
PIO Voltage	+1.7	+3.3	+3.6	V
AIO Voltage	+1.7	+1.8	+1.95	V
LED	+1.1	3.7	+3.6	V
VDD Voltage	+2.7	+3.3	+3.6	V
VCHG(a)	+4.75	+5	+5.75	V
RF frequency	2400	2441	2480	MHz

Table 1: Recommended Operating Conditions

4.3. Absolute Maximum Rating

Rating	Min	Max	Unit
Storage Temperature	-40	+125	°C
PIO Voltage	-0.4	+3.6	V
AIO Voltage	-0.4	+1.95	V
LED	-0.4	+3.6	V
VDD Voltage	-0.4	+3.6	V
VCHG	-0.4	+7.0	V
USB_DP/USB_DN Voltage	-0.4	+3.6	V
Other Terminal Voltages	VSS-0.4	VDD+0.4	V

Table 2: Absolute Maximum Rating Recommended Operating Conditions

4.4. Input/output Terminal Characteristics

4.4.1. Digital Terminals

Digital Terminals	Min	Type	Max	Unit
Input Voltage				
V_{IL} input logic level low	-0.4	-	0.4	V
V_{IH} input logic level high	0.7 x VDD	-	VDD + 0.4	V
Tr/Tf	-	-	25	ns
Output Voltage				
V_{OL} output logic level low, I_{OL} = 4.0mA	-	-	0.4	V
V_{OH} output logic level high, I_{OH} = -4.0mA	0.75 X VDD	-	-	V
Tr/Tf	-	-	5	ns
Input and Tristate Currents				
Strong pull-up	-150	-40	-10	μA
Strong pull-down	10	40	150	μA
Weak pull-up	-5	-1.0	-0.33	μA
Weak pull-down	0.33	1.0	5.0	μA
C_I Input Capacitance	1.0	-	5.0	pF

Table 3: Digital Terminal

4.4.2. USB

	Min	Type	Max	Unit
VDD_USB for correct USB operation	3.10	3.30	3.60	V
Input Threshold				
V_{IL} input logic level low	-	-	0.30 x VDD_USB	V
V_{IH} input logic level high	0.70 x	-	-	V
Input Leakage Current				
$V_{SS\_DIG} < V_{IN} < V_{DD\_USB}$(a)	-1		5	μA
C_I input capacitance	2.5	10		pF
Output Voltage Levels to Correctly Terminated USB Cable				
V_{OL} output logic level low	0	0.2		V
V_{OH} output logic level high	2.80	VDD_USB		V

Table 4: USB Terminal

5. Pinout and Terminal Description

5.1. Pin Configuration

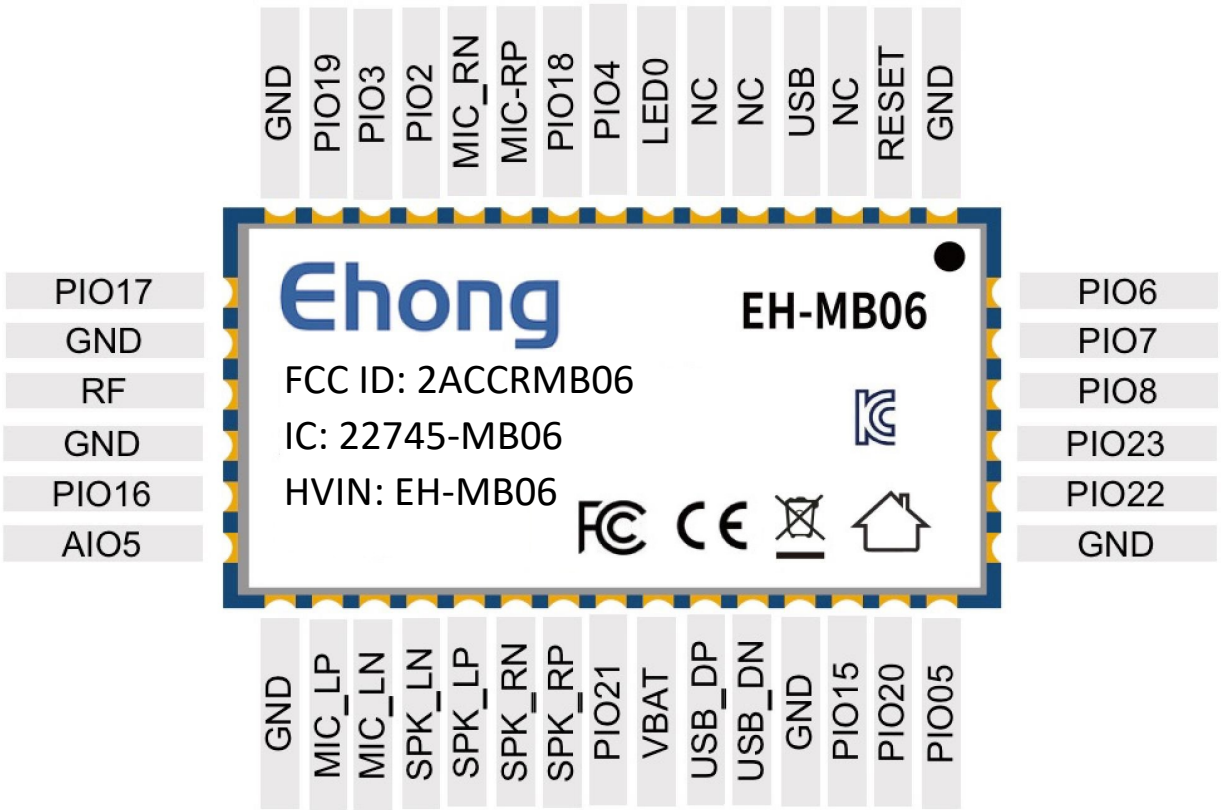


Figure 1：Pinout of EH-MB06

Pin	Symbol	I/O Type	Description
1	GND	Ground	Ground
2	RESETB	CMOS input with weak internal pull-up	Active LOW RESETB, input debounced so must be low for >5ms to cause a RESETB
3	NC		
4	USB_VBUS		Supply to SMPS power switch from charger input.
5	NC		
6	NC		
7	LED0	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
8	PIO4	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 4. Alternative function: ■ TBR_MOSI[1]
9	PIO18	Digital: Bidirectional with programmable strength internal pull up/pull-down internal pull-down	Programmable I/O line 18. Alternative function: ■ PCM_DOUT[0]
10	MIC_RP	Analog	Microphone differential 2 input, positive. Alternative function: ■ Differential audio line input right, positive
11	MIC_RN	Analog	Microphone differential 2 input, negative. Alternative function: ■ Differential audio line input right, negative
12	PIO2	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 2. Alternative function: ■ TBR_MISO[3]
13	PIO3	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 3. Alternative function: ■ TBR_MISO[2]
14	PIO19	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 19. Alternative function: ■ PCM_DIN[0]
15	GND		
16	PIO17	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 17. Alternative function: ■ PCM_SYNC
17	GND		
18	RF	RF	Bluetooth transmit/receive.
19	GND		

20	PIO16	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 16. Alternative function: ■ PCM_CLK
21	AIO5	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
22	GND		
23	MIC_LP	Analog internal pull-down	Microphone differential 1 input, negative. Alternative function: ■ Differential audio line input left, negative
24	MIC_LN	Analog	Microphone differential 1 input, positive. Alternative function: ■ Differential audio line input left, positive
25	SPK_LN	Analog	Headphone/speaker differential left output, negative. Alternative function: ■ Differential left line output, negative
26	SPK_LP	Analog	Headphone/speaker differential left output, positive. Alternative function: ■ Differential left line output, positive
27	SPK_RN	Analog	Headphone/speaker differential right output, negative. Alternative function: ■ Differential right line output, negative
28	SPK_RP	Analog	Headphone/speaker differential right output, positive. Alternative function: ■ Differential right line output, positive
29	PIO21	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 21. Alternative function: ■ PCM_DOUT[2]
30	VBAT	Supply	Supply to SMPS power switch from battery. +2.7V- +3.6V power input
31	USB_DP	Digital	USB Full Speed device D+ I/O. IEC-61000-4-2 (device level) ESD Protection
32	USB_DN	Digital	USB Full Speed device D- I/O. IEC-61000-4-2 (device level) ESD Protection
33	GND		
34	PIO15	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 15. Alternative function: ■ MCLK_OUT
35	PIO20	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 20. Alternative function: ■ PCM_DOUT[1]

36	PIO5	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 5. Alternative function: ■ TBR_MISO[1]
37	GND	Analogue	Microphone input negative, right
38	22	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 22. (UART_TX)
39	23	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 23. (UART_RX)
40	8	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 8. Alternative function: ■ TBR_CLK
41	7	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 7. Alternative function: ■ TBR_MISO[0]
42	6	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 6. Alternative function: ■ TBR_MOSI[0]

Table 5：PIN Terminal Description

6. Physical Interfaces

6.1. Power Supply

- The module DC3.3V power input.
- Power supply pin connection capacitor to chip and pin as far as possible close
- Capacitor decouples power to the chip
- Capacitor prevents noise coupling back to power plane.
-

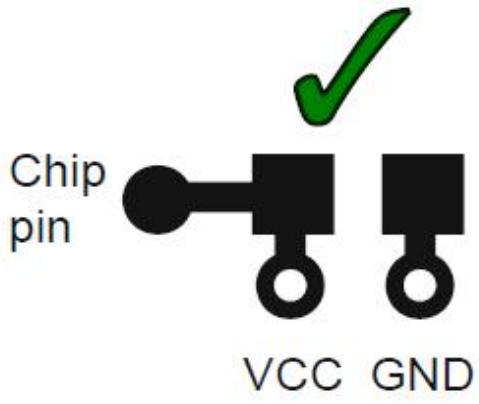


Figure 2：Power Supply PCB Design

6.2. Reset

The module may be reset from several sources: RESETB pin, power-on reset, a UART break character or via software configured watchdog timer.

The RESETB pin is an active low RESETB and is internally filtered using the internal low frequency clock oscillator. A RESETB will be performed between 1.5 and 4.0ms following RESETB being active. It is recommended that RESETB be applied for a period greater than 5ms.

QSPI_SRAM_CS	Strong PU
QSPI_FLASH_CS	Strong PU
QSPI_SRAM_CLK	Strong PD
QSPI_FLASH_CLK	Strong PD

Table 6: Pin Status on Reset

6.3. PIO

EH-MB06 has a total of 13digital programmable I/O terminals. They are powered from VDD . Their functions depend on firmware running on the device. PIO lines can be configured through software to have either weak or strong pull-ups or pull-downs.

Note:

All PIO lines are configured as inputs with weak pull-downs at reset.

Any of the PIO lines can be configured as interrupt request lines or as wake-up lines from sleep modes.

6.4. AIO

EH-MB06 has 2 analogue I/O terminals. Their functions depend on software. Typically ADC functions can be configured to battery voltage measurement. They can also be used as a digital PIO.

6.5. RF interface

EH-MB06 internet chip antenna and U.fl port choose one of the ways. U.fl port external antenna, impedance is 50 ohm.

6.6. UART

This is a standard UART interface for communicating with other serial devices. The UART interface provides a simple mechanism for communicating with other serial devices using the RS232 protocol.

The UART CTS and RTS signals can be used to implement RS232 hardware flow control where both are active low indicators.

Bits per Byte	8

Table 7: Possible UART Settings

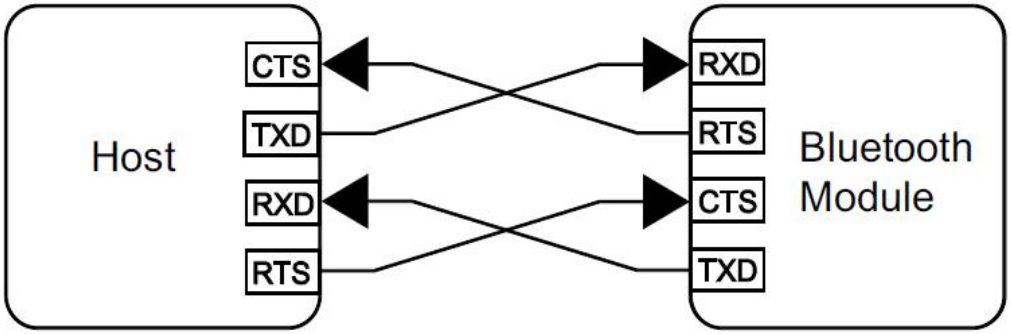


Figure 3：Connection To Host device

6.7. Digital Audio Interfaces

The audio interface circuit consists of:

- ✧ Stereo/Dual-mono audio codec
- ✧ Dual audio inputs and outputs
- ✧ 6 digital MEMS microphone inputs
- ✧ A configurable PCM, I²S or SPDIF interface

Figure 2 outlines the functional blocks of the interface. The codec supports stereo playback and recording of audio signals at multiple sample rates with a resolution of 16-bit. The ADC and the DAC of the codec each contain 2 independent channels. Any ADC or DAC channel can be run at its own independent sample rate.

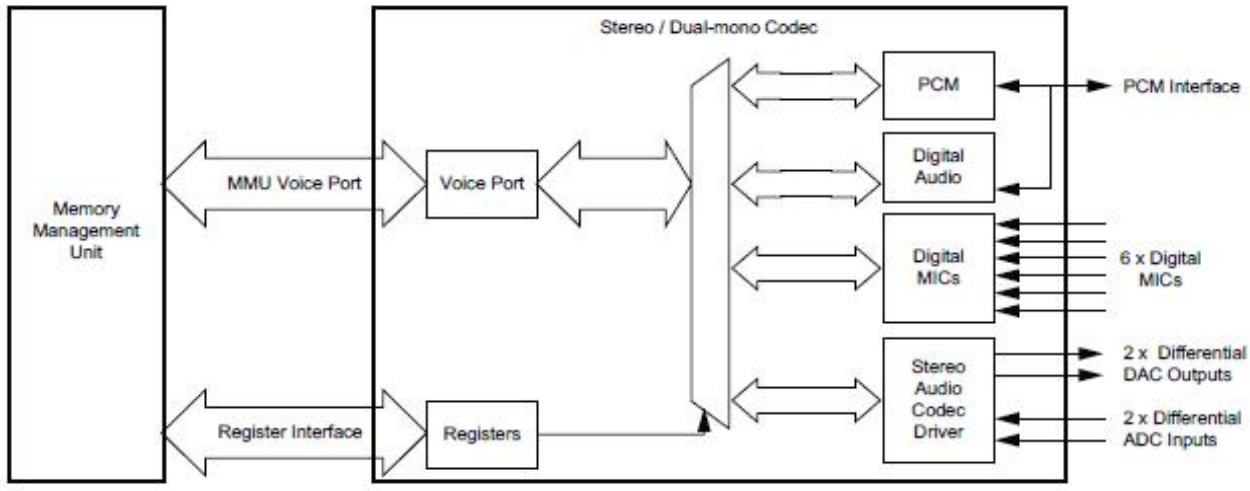


Figure 4 : Audio Interface

The interface for the digital audio bus shares the same pins as the PCM codec interface described in Table 8, which means each of the audio buses are mutually exclusive in their usage. Table 8 lists these alternative functions.

PCM Interface	SPDIF Interface	I²S Interface
PCM_OUT	SPDIF_OUT	SD_OUT
PCM_IN	SPDIF_IN	SD_IN
PCM_SYNC	-	WS
PCM_CLK	-	SCK

Table 8: Alternative Functions of the Digital Audio Bus Interface on the PCM Interface

The audio input circuitry consists of a dual audio input that can be configured to be either single-ended or fully differential and programmed for either microphone or line input. It has an analogue and digital programmable gain stage for optimization of different microphones.
The audio output circuitry consists of a dual differential class A-B output stage.

6.7.1. PCM

The audio pulse code modulation (PCM) interface supports continuous transmission and reception of PCM encoded audio data over Bluetooth.
Hardware on EH-MB06 allows the data to be sent to and received from a SCO connection. Up to three SCO connections can be supported by the PCM interface at any one time.
EH-MB06 can operate as the PCM interface master generating PCM_SYNC and PCM_CLK or as a PCM interface slave accepting externally generated PCM_SYNC and PCM_CLK.
EH-MB06 is compatible with a variety of clock formats, including Long Frame Sync, Short Frame Sync and GCI timing environments.
It supports 13-bit or 16-bit linear, 8-bit u-law or A-law companded sample formats and can receive and transmit on any selection of three of the first four slots following PCM_SYNC.
EH-MB06 interfaces directly to PCM audio devices including the following:

- Qualcomm MSM 3000 series and MSM 5000 series CDMA baseband devices
- OKI MSM7705 four channel A-law and μ-law CODEC
- Motorola MC145481 8-bit A-law and μ-law CODEC
- Motorola MC145483 13-bit linear CODEC
- STW 5093 and 5094 14-bit linear CODECs(8)
- EH-MB06 is also compatible with the Motorola SSI interface

6.7.2. Digital Audio Interface (I2S)

The digital audio interface supports the industry standard formats for I2S, left-justified or right-justified. The interface shares the same pins of the PCM interface as Table 8.

Special firmware is needed if I2S is used. Contact EHong for the special firmware when use I2S as the interface between the module and the host or the codec. The I2S support following formats.

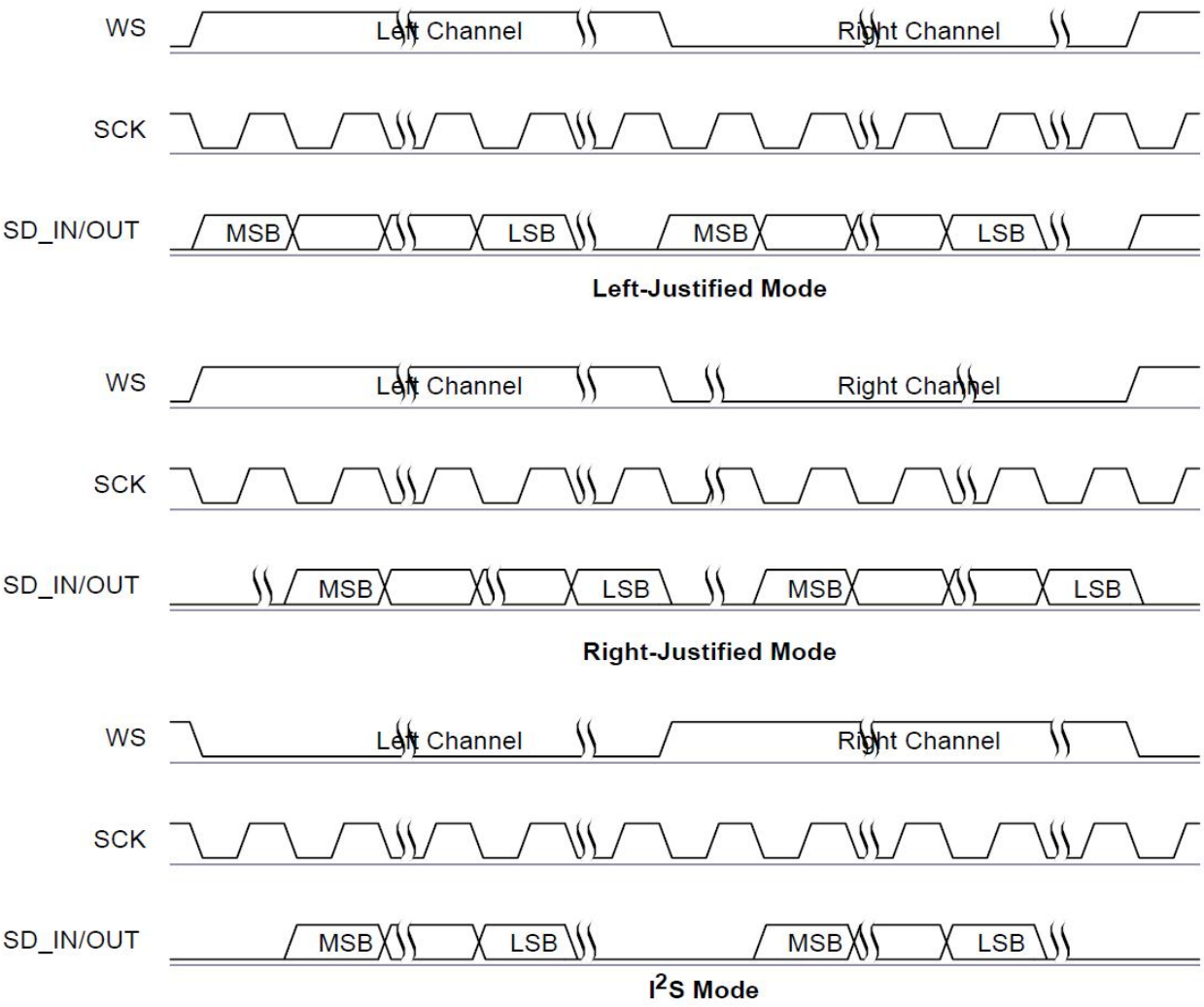


Figure 5 : Digital Audio Interface Modes

Symbol	Parameter	Min	Typical	Max	Unit
-	SCK Frequency	-	-	6.2	MHz
-	WS Frequency	-	-	96	kHz
t_{ch}	SCK high time	80	-	-	ns
t_{cl}	SCK low time	80	-	-	ns
t_{opd}	SCK to SD_OUT delay	-	-	20	ns
t_{ssu}	WS to SCK set up time	20	-	-	ns
t_{sh}	WS to SCK hold time	20	-	-	ns
t_{isu}	SD_IN to SCK set-up time	20	-	-	ns

t_{ih}	SD_IN to SCK hold time	20	-	-	ns

Table 9 : Digital Audio Interface Slave Timing

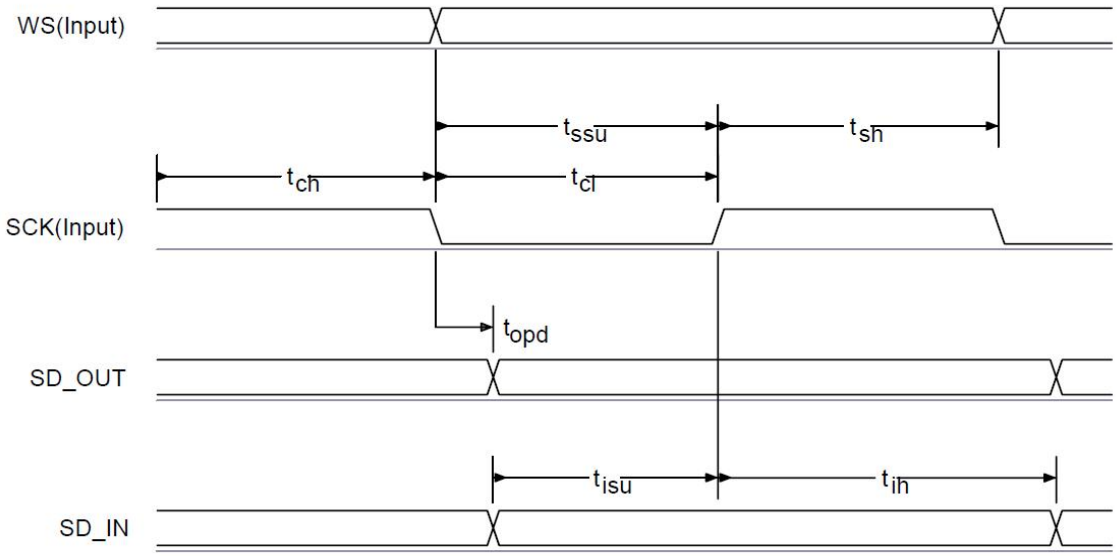


Figure 6 : Digital Audio Interface Slave Timing

Symbol	Parameter	Min	Typical	Max	Unit
-	SCK Frequency	-	-	6.2	MHz
-	WS Frequency	-	-	96	kHz
t_{opd}	SCK to SD_OUT delay	-	-	20	ns
t_{spd}	SCK to WS delay	-	-	20	ns
t_{isu}	SD_IN to SCK set-up time	20	-	-	ns
t_{ih}	SD_IN to SCK hold time	10	-	-	ns

Table 10 : Digital Audio Interface Master Timing

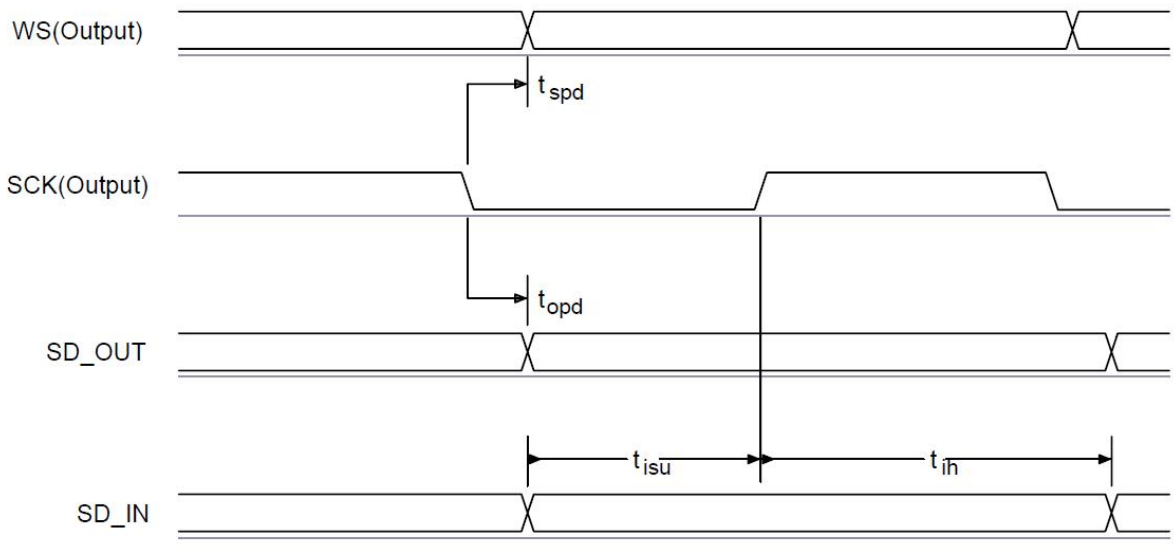


Figure 7 : Digital Audio Interface Master Timing

6.7.3. IEC 60958 Interface (SPDIF)

The IEC 60958 interface is a digital audio interface that uses bi-phase coding to minimise the DC content of the transmitted signal and allows the receiver to decode the clock information from the transmitted signal. The IEC 60958 specification is based on the 2 industry standards:

- AES/EBU
- Sony and Philips interface specification SPDIF

The interface is compatible with IEC 60958-1, IEC 60958-3 and IEC 60958-4.

The SPDIF interface signals are SPDIF_IN and SPDIF_OUT and are shared on the PCM interface pins. The input and output stages of the SPDIF pins can interface to:

- A 75Ω coaxial cable with an RCA connector, see Figure 8.
- An optical link that uses Toslink optical components, see Figure 9.

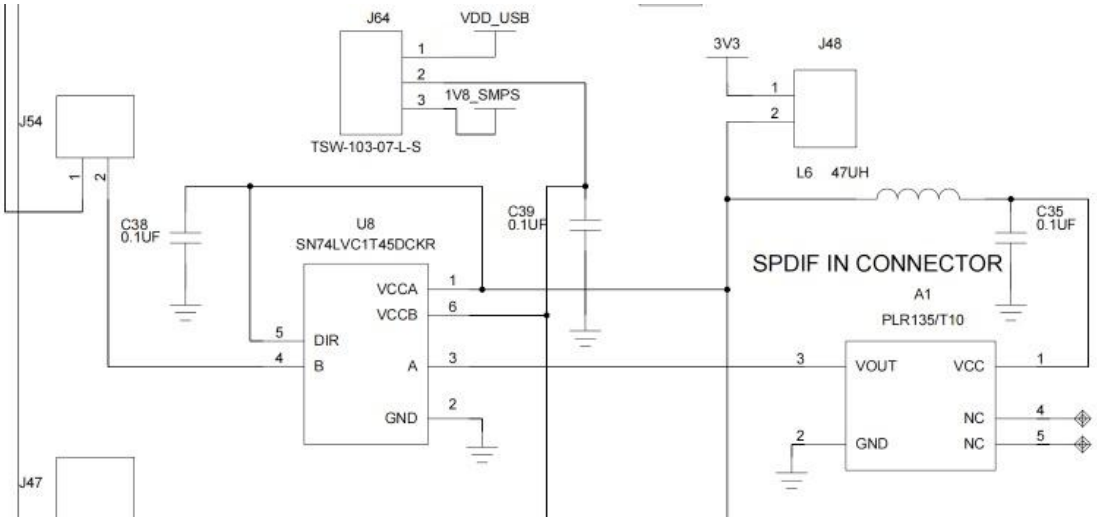


Figure 8: Example Circuit for SPDIF In Connector

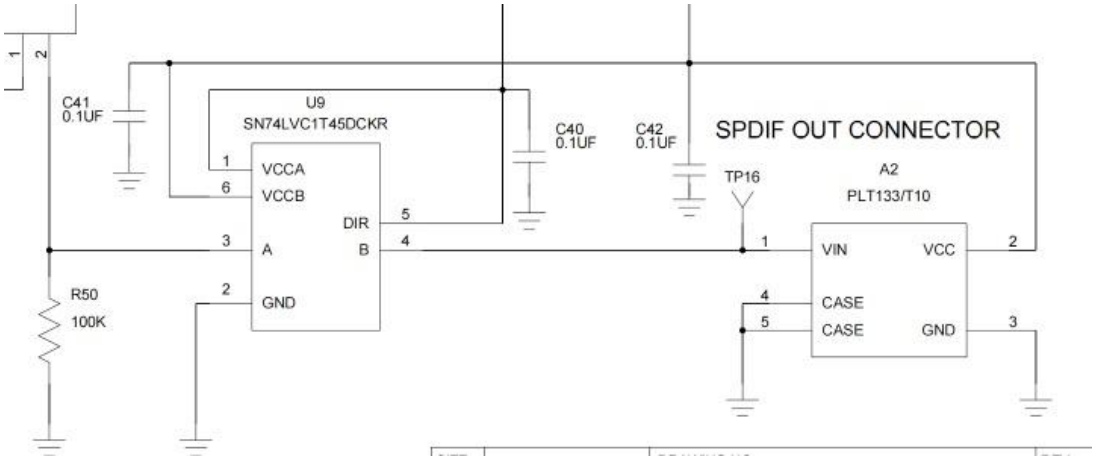


Figure 9: Example Circuit for SPDIF Out Connector

6.8. Microphone input

The module contains 2 independent low-noise microphone bias generators. The microphone bias generators are recommended for biasing electric condensor microphones. Figure 9.6 shows a biasing circuit for microphones with a sensitivity between about -40 to -60dB (0dB = 1V/Pa):

Where:

- The microphone bias generators derives their power from VBAT or VOUT_3V3 \ and requires no capacitor on its output.
- The microphone bias generators maintains regulation within the limits 70μA to 2.8mA, supporting a 2mA source typically required by 2 electret condensor microphones. If the microphone sits below these limits, then the microphone output must be pre-loaded with a large value resistor to ground.
- Biasing resistors R1 and R2 equal 2.2kΩ.
- The input impedance at MIC_LN, MIC_LP, MIC_RN and MIC_RP is typically 6kΩ.
- C1, C2, C3 and C4 are 100/150nF if bass roll-off is required to limit wind noise on the microphone.
- R1 and R2 set the microphone load impedance and are normally around 2.2kΩ.

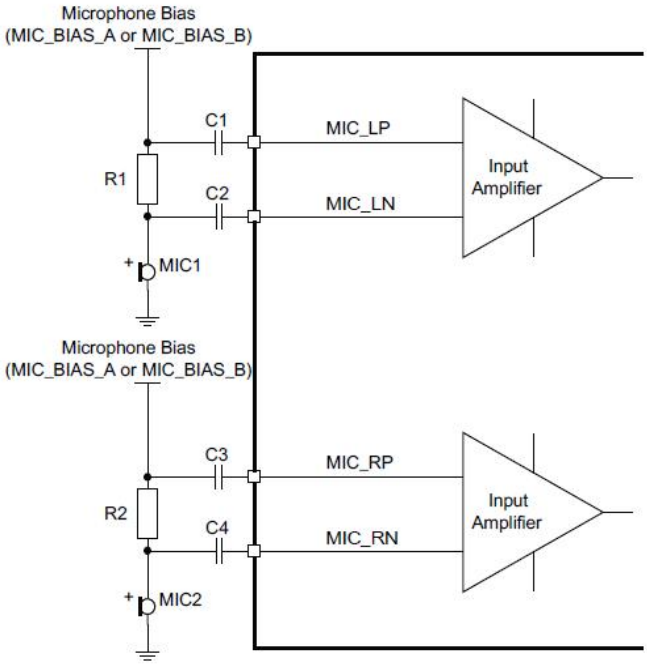


Figure 10: Microphone Biasing (Single Channel Shown)

The microphone bias characteristics include:

- Power supply:
- QCC2032 microphone supply is VBAT (via SMP_VBAT) or VOUT_3V3 (via SMPS_3V3)
- Minimum input voltage = Output voltage + drop-out voltage
- Maximum input voltage is 4.25V
- Drop-out voltage:
- 300mV maximum
- Output voltage:
- 1.8V or 2.6V
- Tolerance 90% to 110%
- Output current:
- 70μA to 2.8mA
- No load capacitor required

6.9. Analog Output stage

The output stage digital circuitry converts the signal from 16-bit per sample, linear PCM of variable sampling frequency to a 2Mbits/s 5-bit multi-bit bit stream, which is fed into the analogue output circuitry.

The output stage circuit is comprised a DAC with gain setting and class AB amplifier. The output is available as a differential signal between SPKR_A_N and SPKR_L_P for the right channel, as Figure 6 shows, and between SPKL_B_N and SPKL_B_P for the left channel.

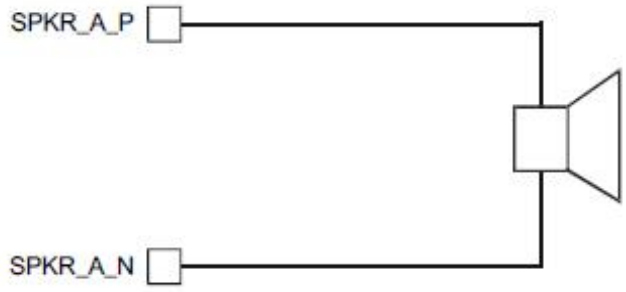


Figure 11: Speaker output

6.10. USB

This is a full speed (12M bits/s) USB interface for communicating with other compatible digital devices. The module acts as a USB peripheral, responding to request from a master host controller, such as a PC.

The USB interface is capable of driving a USB cable directly. No external USB transceiver is required. The device operates as a USB peripheral, responding to requests from a master host controller such as a PC. Both the OHCI and the UHCI standards are supported. The set of USB endpoints implemented can behave as specified in the USB section of the Bluetooth specification v2.1+EDR or alternatively can appear as a set of endpoints appropriate to USB audio devices such as speakers.

The module has an internal USB pull-up resistor. This pulls the USB_DP pin weakly high when module is ready to enumerate. It signals to the USB master that it is a full speed (12Mbit/s) USB device.

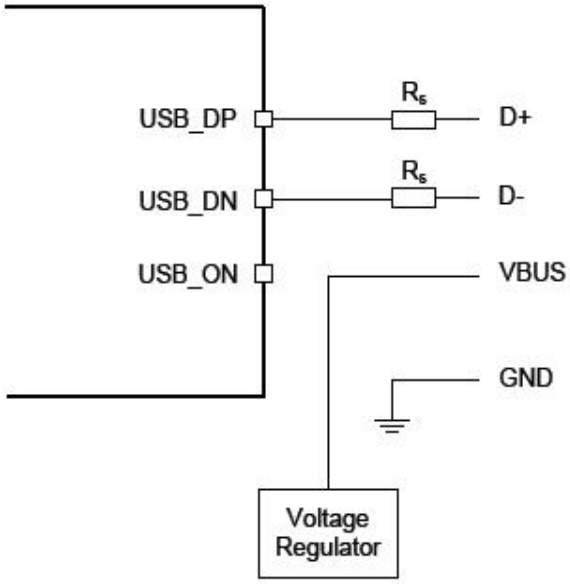


Figure 12: USB Connections

Identifier	Value	Function
R_s	27Ω Nominal	Impedance matching to USB cable

Table 11: USB Interface Component Values

Note:
USB_ON is only used when the firmware need an input to detect if USB is connected and the USB function shall be enabled. In such case it is shared with the module PIO terminals. If detection is not needed (firmware already runs with USB, such as USB DFU or USB CDC), USB_ON is not needed.

7. EH-MB06 Reference Design

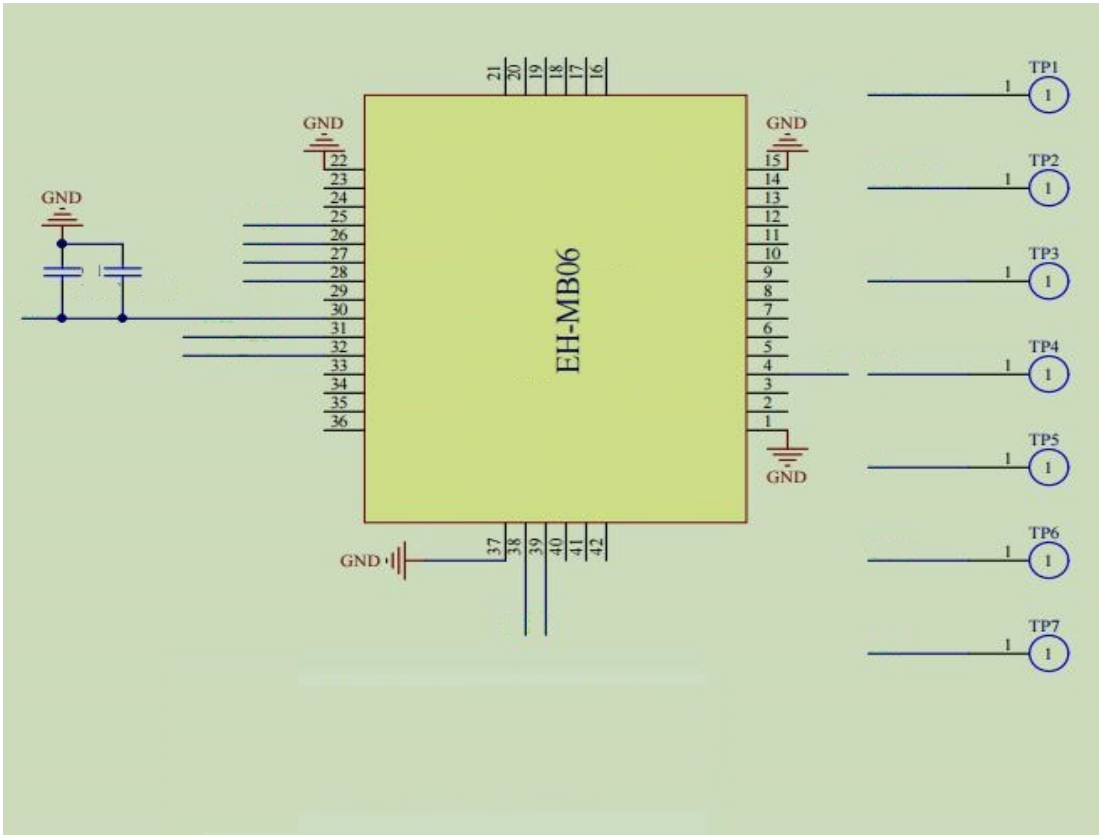


Figure 13: Reference Design

8. Mechanical and PCB Footprint Characteristics

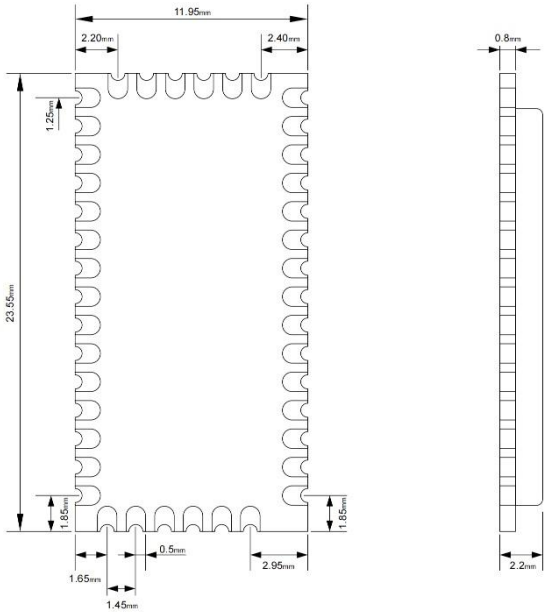


Figure 14: Mechanical Drawing

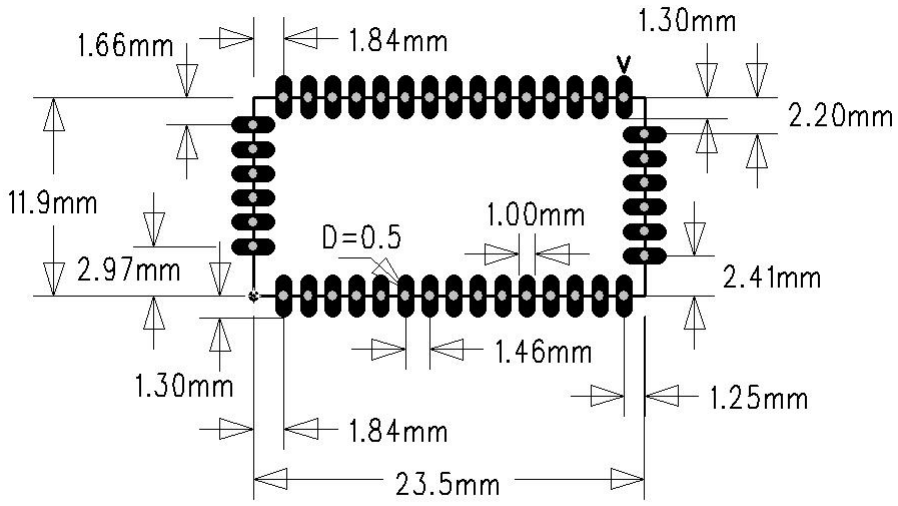


Figure 15: Recommended PCB Mounting Pattern (Unit: mm, Deviation:0.02mm)

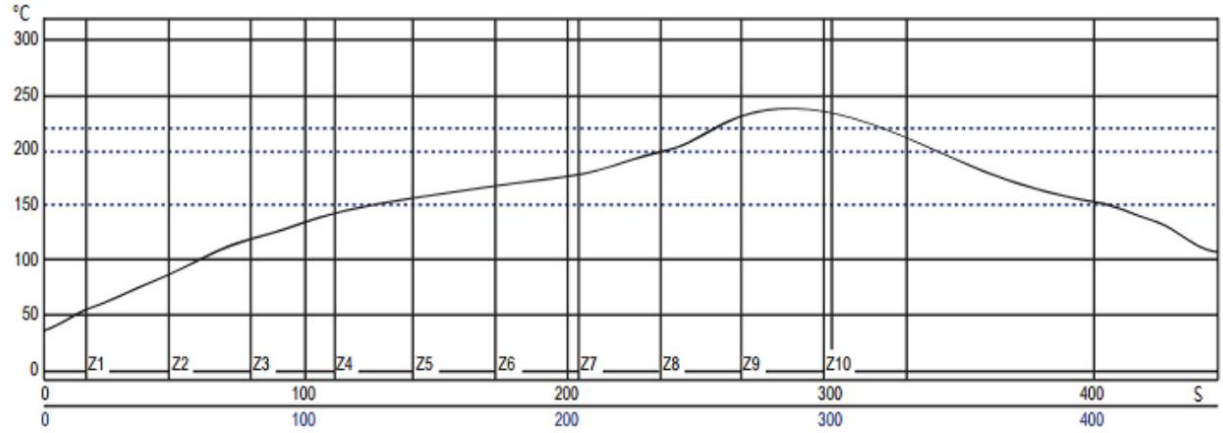
9. Soldering Recommendations

EH-MB06 is compatible with industrial standard reflow profile for Pb-free solders. The reflow profile used is dependent on the thermal mass of the entire populated PCB, heat transfer efficiency of the oven and particular type of solder paste used. Consult the datasheet of particular solder paste for profile configurations.

SMT stencil making requirements

- If Bluetooth module PIN pitch ≥ **0.25mm** and other component PIN pitch ≥ **0.25mm** ,so you choose SMT stencil thickness **1.5mm**。
- If Bluetooth module PIN pitch ≥ **0.25mm** and other component PIN pitch ≤ **0.25mm** ,so you choose SMT Ladder stencil Bluetooth module thickness **1.5mm** other component thickness 1.3mm .
- Solder pad open via ratio **Length 1:1.2**, **width 1:1.**

The EH-MB06 modules can be SMT on the board following the temperature curve graph:



10. Contact Information

Sales: sales@ehonglink.com

Technical support: support@ehonglink.com

Website: www.ehonglink.com

Phone: +86 21 64769993

Fax: +86 21 64765833

Address: Room 501, No.485 Xingmei Road, Minhang Dis,Shanghai, China.

FCC Statement

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

Note : This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates,uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

FCC Label Instructions

If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

"Contains FCC ID: 2ACCREH-MB06".

Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement.

ISED RSS Warning/ISED RF Exposure Statement

ISED RSS Warning:

This device complies with Innovation, Science and Economic Development Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence.L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED RF exposure statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le rayonnement de la classe b repecte ISED fixaient un environnement non contrôlés.Installation et mise en œuvre de ce matériel devrait avec échangeur distance minimale entre 20 cm ton corps.Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d'autres.

OEM Guidance

1. Applicable FCC rules

This device complies with part 15.247 of the FCC Rules.

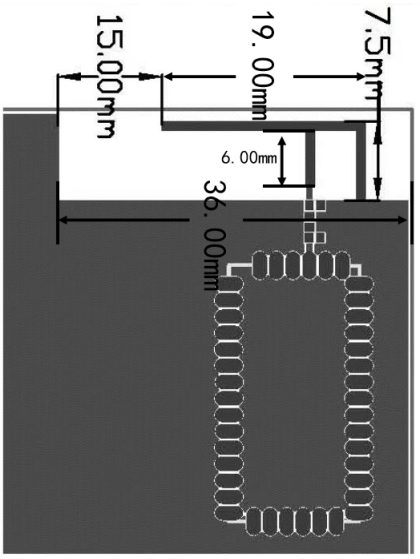
2. The specific operational use conditions

This module can be used in IoT devices. The input voltage to the module is nominally 3.3 V DC. The operational ambient temperature of the module is -40 °C ~ 85 °C. An onboard PCB antenna is integrated for this module.

3. Limited module procedures

N/A

4. Trace antenna design



5. RF exposure considerations

The equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. If the equipment built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1093.

6. Antenna

Antenna type: PCB antenna; Peak antenna gain : 2 dBi

7. Label and compliance information

An exterior label on OEM's end product can use wording such as the following: "Contains Transmitter Module FCC ID: 2ACCREH-MB06" or "Contains FCC ID: 2ACCREH-MB06"

8. Information on test modes and additional testing requirements

6. The modular transmitter has been fully tested by the module grantee on the required number of channels,modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter,perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

7. The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

8. If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected .

9. Additional testing, Part 15 Sub part B disclaimer The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance

in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation

When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory 50 devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

The product under test is set into a link/association with a partnering device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

ISED Important Note:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the ISED cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

Any company of the host device which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to RSS-247 and RSSGen requirement, only if the test result comply with RSS-247 and RSS-Gen requirement, then the host can be sold legally.

Note Importante:
Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considérée comme valide et l' ISED ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l' émetteur) et l'obtention d'une autorisation distincte au Canada. toute entreprise de l'hôte qui installent ce dispositif modulaire avec limite approbation devrait effectuer l'essai des modules et des rayonnements non essentiels des émissions rayonnées selon rss-247 et le cnr - gen, seulement si le résultat d'essai conforme rss-247 et le cnr - gen, puis l'hôte peut être vendu légalement.

End Product Labeling
The final end product must be labeled in a visible area with the following: Contains IC:22745-MB06.

Plaque signalétique du produit final
Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: Contient des IC:22745-MB06.

Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final
L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

This radio transmitter [22745-MB06] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, It has an antenna with the maximum antenna gain is 2dBi.

Antenna type	Maximum Antenna gain
PCB Antenna	2dBi

Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Cet émetteur radio [22745-MB06] a été approuvé par Innovation, Science et développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous.
Il dispose d'une antenne avec une prise le gain maximum d'antenne est de 2dBi.

Antenna type	Maximum Antenna gain
PCB Antenna	2dBi

Les types d'antennes non inclus dans cette liste qui ont un gain supérieur au gain maximum indiqué pour tout type répertoriésont strictement interdits pour l'utilisation avec cet appareil.