EWM104-BT3040 (xxx) User Manual

QCC3040 BLE5.2 DAC/I2S Wireless Bluetooth Audio Module



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Table of contents

Disclaimer and Copyright Notice 1
Chapter 1 Overview 2
1.1 Introduction 2
1.2 Features 2
1.3 Application Scenario 2
Chapter 2 Specifications 3
2.1 Basic parameters 3
2.2 Performance parameters 3
2.3 Mechanical dimensions and pin definition 4
Chapter 3 Quick Use 7
Chapter 4 Hardware Circuit Design and Requirements 8
4.1 Hardware Design Requirements 8
Chapter 5 FAQ 8
5.2 Modules are vulnerable to damage 9
Chapter 6 Welding Operation Instructions 10
6.1 Reflow Temperature 10
6.2 Reflow Oven Curve 11
Chapter 7 Related Models 12
Revision History 13
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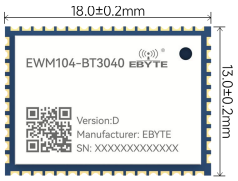
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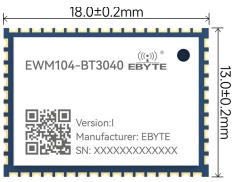
Chapter 1 Overview

1.1 Introduction

EWM104-BT3040(xxx) is a high-performance, low-power, cost-effective Bluetooth BLE5.2 audio module launched by our company . The main control adopts Qualcomm's QCC3040 chip to provide the module with a system with on-chip Bluetooth, audio and programmable application processor. It includes high-performance analog and digital audio codecs, class AB and class D headphone drivers, advanced power management, flexible interface protocols and programmable input/output (PIO). The two modules in the figure below are package compatible, but have different output interfaces.



EWM104-BT3040(DAC)



EWM104-BT3040(I2S)

1.2 Features

- Bluetooth 5.2 protocol ;
- 120 MHz Qualcomm® Kalimba ™ audio DSP ;
- 32MHz application development processor ;
- High-performance 24-bit audio interface ;
- Digital and analog microphone interfaces ;
- Flexible PIO controller and LED pins, supporting pulse width modulation ;
- Supports a variety of interfaces, such as UART, (l2C/SPI), USB 2.0, etc., which is convenient for users to use;
- Fully programmable digital ANC ;
- Support aptX, aptX HD , etc.
- It has Qualcomm cVc noise cancellation technology ;
- Integrated battery charger ;
- Differential headphone output mode, supports Class AB and Class D.

1.3 Application Scenarios

- High-quality stereo headphones ;
- Gaming headset;
- Portable Bluetooth Stereo Speaker ;
- TWS Bluetooth headset, Bluetooth speaker, etc.

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Chapter 2 Specifications

2.1 Basic parameters

Main parameters	Description	Remark
Reference distance	2 20 m	Open space, sunny weather.
Crystal frequency	32 MHz	
Packaging	SMD	
EWM104-BT3040 (DAC) output interface	DAC	
EWM104-BT3040 (I2S) output interface	I2S	
Communication interface	USB	
Interface	Stamp Holes	Pitch 1.00mm
Dimensions	13 * 18 mm	±0.2mm
Antenna interface	Stamp Holes	Equivalent impedance is about 50Ω
Weight	1.0g	±0.1g

2.2 Performance parameters

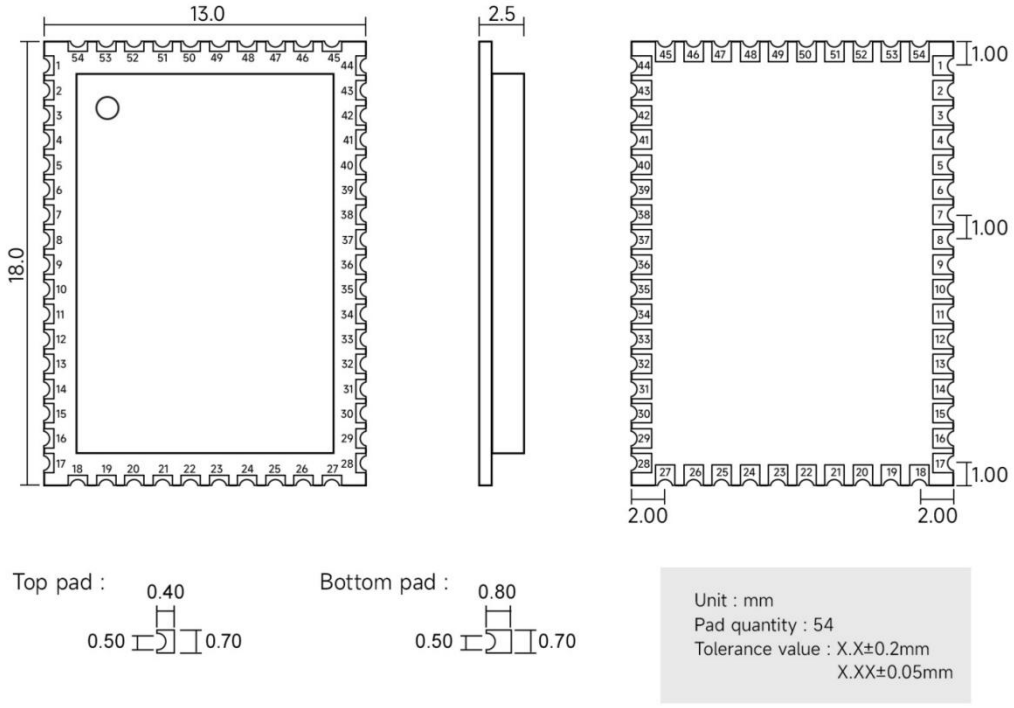
Main parameters		Performance			Remark
		Minimum	Typical Value	Maximum	
Operating voltage VCHG (V)		4.0	5	6.5	Exceeding 6.5V may permanently burn the module
Working voltage VBAT (V)		3.0	3.7	4.6	Exceeding 4.6V may permanently burn the module
Communication level (V)		1.8	3.3	3.6	The level is determined by VDD_PADS1 and VDD_PADS3 levels
Operating temperature (°C)		-40	20	+85	Industrial-grade design
Operating frequency band (MHz)		2402	-	2480	Support Bluetooth protocol standard frequency band
Power consumption	Emission current (mA)	40	-	48	
	Shutdown current (uA)	-	150	-	When only VBAT is powered

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Maximum transmit power (dBm)	-	9	10	
Receiving sensitivity (dBm)	-	-9 6 .0	-	BER

2.3 Mechanical dimensions and pin definition



Note: EWM104-BT3040 (DAC) and EWM104-BT3040 (I2S) are package compatible.

Pin number	Pin Name	Pin Direction	Pin Purpose
1	PIO[20]	I/O	Programmable I/O port 20 , other functions: PCM_DOUT1
2	PIO[19]	I/O	PIO[19]
3	PIO[18]	I/O	I2S bit data output, PIO[18]
4	PIO [17]	I/O	I2S frame clock output, PIO[17]
5	PIO[16]	I/O	I2S bit clock output, PIO[16]
6	PIO[15]	I/O	I2S system clock output , PIO[15]
7	VBAT_SENSE	Analog	Battery voltage detection
8	USB_DN	-	Full-speed USB interface DN
9	USB_DP	-	Full-speed USB interface DP
10	VCHG	P	Internal power regulator and charger voltage input, 4.0~6.5V
11	V CHG _SENSE	Analog	Charger input voltage detection pin. When using the internal charger or no charger, this pin is connected to the VCHG pin.
12	CHG_EXT	Analog	External charger transistor current control.
13	SYS_CTRL	I	Usually connected to a switch button PIO[0], in the out-of-box state, the rising edge is in power_on mode, the falling edge is in power_off mode, and the power-on automatically enters the pairing state
14	VBAT	P	Battery power input, 3.0 ~4.6V
15	GND	G	GND

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16	LED[0]	Analog/DO	Analog/digital input, open-drain LED output. Flashes alternately with LED1 in paired state
17	LED[1]	Analog/DO	Analog/digital input, open-drain LED output. Flashes alternately with LED 0 in pairing mode , and stays on when connected to Bluetooth
18	LED[2]	Analog/DO	Analog/digital input, open-drain LED output
19	LED[4]	Analog/DO	Analog/digital input, open-drain LED output
20	LED[5]	Analog/DO	Analog/digital input, open-drain LED output
21	GND	-	GND
22	1V8	P	1.8V power output
23	VDD_PADS1	P	1.8V/3.3V PIO voltage input
24	VDD_PADS3	P	1.8V/3.3V PIO voltage input
25	PIO[4]	I/O	Short press for next song, long press for volume up (need to be out of the warehouse + media playing conditions) , user programmable
26	PIO[3]	I/O	Short press to go to the previous song, long press to reduce the volume (need to be out of the warehouse + media playing conditions) , user programmable
27	PIO[6]	I/O	PIO[6]
28	PIO[5]	I/O	Available in out-of-warehouse state , short press LED0 , LED 1 , LED 2 flash, user programmable
29	PIO[8]	I/O	PIO[8]
30	PIO[7]	I/O	PIO[7]
31	PIO[2]	I/O	PIO[2], short press to play and pause, long press for 3 seconds to enter pairing, long press for 6 seconds to clear the pairing list, user programmable
32	RESET / PIO[1]	I/O	Reset, PIO[1]
33	PIO[60]	I/O	PIO[60]
34	NC	-	-
35	NC	-	-
36	SPK-LN	Analog	DAC audio differential output left channel negative
37	SPK-LP	Analog	DAC audio differential output left channel positive
38	GND	-	GND
39	MIC_BIAS	Analog	Microphone bias voltage output, 1.5~2.1V
40	MIC2_N	Analog	Microphone differential input right channel negative pole, not used by default firmware, user programmable
41	MIC2_P	Analog	Microphone differential input right channel positive , not used by default firmware, user programmable
42	MIC1_N	Analog	Microphone differential input left channel negative , not used by default firmware, user programmable
43	MIC1_P	Analog	Microphone differential input left channel positive , not used by default firmware, user programmable
44	GND	-	GND
45	GND	-	GND
46	RF_PORT	-	Bluetooth antenna interface
47	GND	-	GND
48	PIO[14]	I/O	PIO[14]

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49	PIO[13]	I/O	PIO[13]
50	PIO[12]	I/O	PIO[12]
51	PIO[11]	I/O	PIO[11]
52	PIO[10]	I/O	PIO[10]
53	PIO[09]	I/O	PIO[09]
54	PIO[21]	I/O	PIO[2 1] , audio amplifier enable, customer programmable

Special attention:

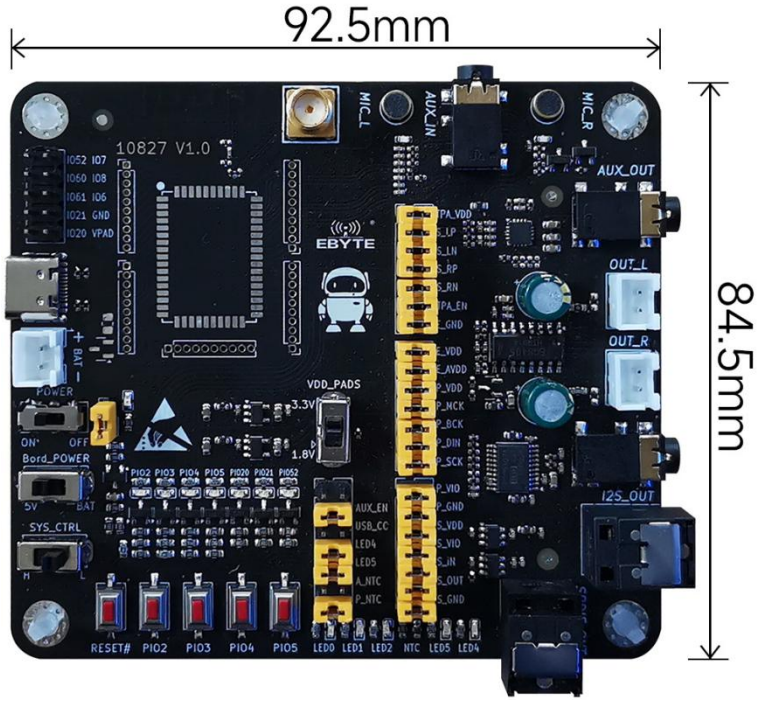
The above pin function description is only for the default program function when our company ships from the factory. If you need other functions, please contact our company for customization. If you want to develop pin functions yourself, please refer to the official user manual of QCC3040 .

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Chapter 3 Quick Use

This is to be operated when using together with our test baseboard EWT104-DA10 + adapter board EWT104-QC01Z. The following figure is a physical picture of the test board:



The Bluetooth audio test baseboard does not contain modules by default. Customers can purchase modules for welding and use according to their needs. Here, take the DAC firmware module as an example. After welding the module to the baseboard, power it through Type-C. After the power indicator lights up, set the SYS_CTRL dip switch to the right (only valid when powered by BAT, invalid if powered by Type-C) , and Bluetooth pairing will be automatically turned on. Then use the mobile phone to connect to the module via Bluetooth to play music, and then connect the AUX_OUT interface of the baseboard to the speaker to hear the music played by the mobile phone.

The product details page will provide the serial port driver installation method and schematic diagram. For secondary development, you need to go to Qualcomm's official website for reference:
https://www.qualcomm.com/products/internet-of-things/consumer/audio/qcc30xx-series/qcc3040

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Chapter 4 Hardware Circuit Design and Requirements

4.1 Hardware Design Requirements

- SYS_CTRL cannot be directly pulled up to VBAT. SYS_CTRL controls the power on and off of the Bluetooth chip. The power on action can only be performed after the chip is powered on and initialized. It cannot be simply delayed by resistors and capacitors (unstable). For related delay circuits, refer to the recommended circuits in the official user manual.
- The audio output and MIC input of the module are both differential circuits. For related hardware design, please refer to our hardware design circuit.
- High-frequency digital routing, high-frequency analog routing, and power routing must avoid the bottom of the module. If it is necessary to pass under the module, assuming that the module is soldered on the Top Layer, ground copper is laid on the Top Layer of the module contact part (all copper is laid and well grounded), and it must be close to the digital part of the module and routed on the Bottom Layer;
- Assuming the module is soldered or placed on the Top Layer, it is also wrong to randomly route the wires on the Bottom Layer or other layers, which will affect the module's spurious signal and receiving sensitivity to varying degrees;
- It is recommended to use USB or battery to power the module. The power ripple coefficient should be as small as possible and the module should be reliably grounded.
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module.
- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, the module will be permanently damaged.
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% margin, which is conducive to long-term stable operation of the whole machine;
- The module should be kept as far away as possible from power supplies, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- If there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module. It is recommended to keep them away from the module according to the intensity of the interference. If possible, appropriate isolation and shielding can be performed.
- If there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power traces), it will also greatly affect the performance of the module. It is recommended to keep them away from the module according to the intensity of the interference. If possible, appropriate isolation and shielding can be performed.
- The module antenna must not be installed inside the metal shell, as this will greatly reduce the transmission distance.

Chapter 5 Frequently Asked Questions

5.1 The transmission distance is not ideal

- When there is a straight-line communication obstacle, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-channel interference can increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, so the test results are poor when close to the ground;
- Seawater has a strong ability to absorb radio waves, so the test effect at the seaside is poor;

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- If there are metal objects near the module or the module is placed in a metal shell, the signal attenuation will be very serious;
- The power supply voltage at room temperature is lower than the recommended value. The lower the voltage, the lower the power output.

5.2 Module is vulnerable to damage

- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, the module will be permanently damaged.
- Please check the stability of the power supply. The voltage should not fluctuate greatly or frequently.
- Please ensure anti-static operation during installation and use, as high-frequency components are sensitive to static electricity;
- Please ensure that the humidity is not too high during installation and use, as some components are humidity sensitive devices;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

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Chapter 6 Welding Operation Instructions

6.1 Reflow Temperature

During reflow soldering, all temperatures refer to the center temperature of the package, measured on the upward package surface (leads facing down, i.e. live worm direction). If the reflow soldering does not use the live worm direction (leads facing up, i.e. dead worm direction) to measure the module temperature, the measured Tp temperature is within ±2°C of the Tp temperature measured in the live worm direction, and still meets the Tc requirement. Otherwise, the temperature curve should be adjusted to meet the Tc requirement. In order to accurately measure the actual peak temperature of the package body, it is recommended to use the method recommended by JEP140 to perform furnace temperature testing.

In order to obtain better welding results, the production workshop recommends controlling the temperature at 25°C. When the temperature curve of the welded parts needs to be reset, the same structure of the load fixture should be used for reflow soldering, or it should be verified to have an equivalent heat load.

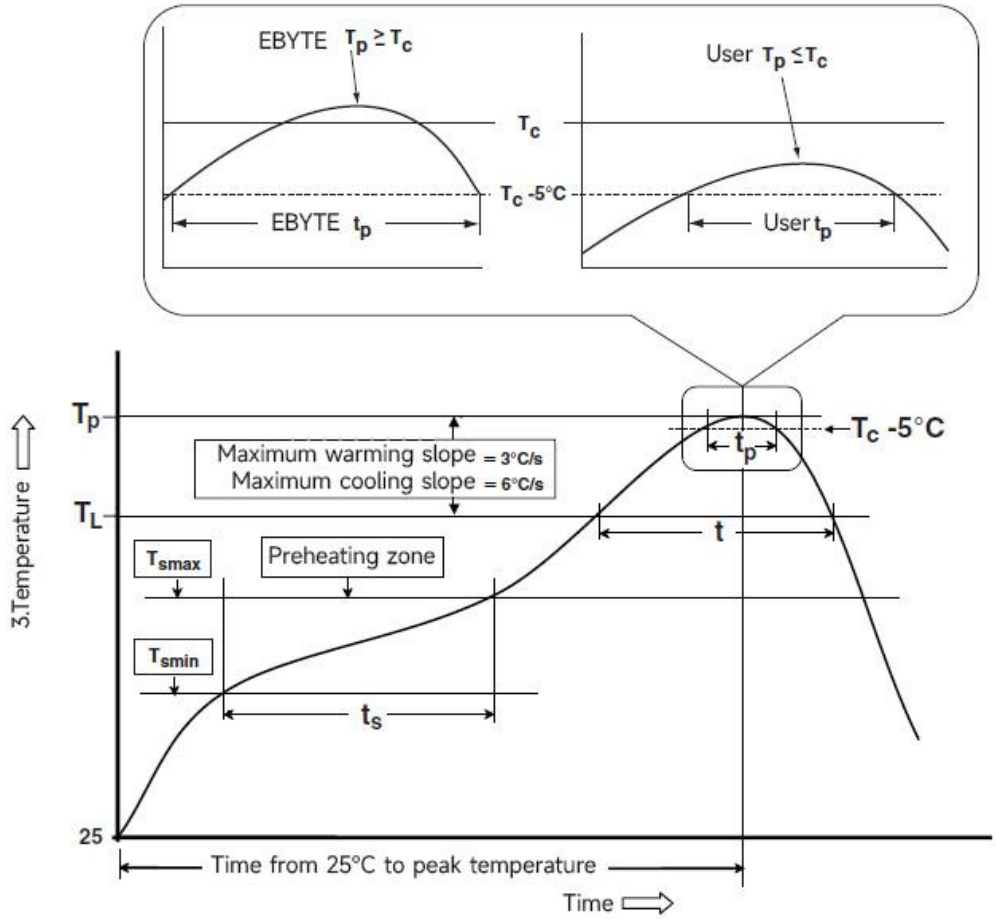
The reflow soldering curves in this document are some suggestions specifically for soldering Ebyte modules and cannot be used to confirm the user's actual assembly curve. The user's actual production process should be based on the specific production process, needs and circuit board design to develop the actual production assembly curve, and should not exceed the following table:

Reflow profile characteristics		Leaded process assembly	Lead-free assembly
Preheating/keeping	Minimum temperature (Tsmin)	100℃	150℃
	Maximum temperature (Tsmax)	150℃	200℃
	Time (Tsmin~Tsmin)	60-120 seconds	60-120 seconds
Heating slope (TL~Tp)		3℃/sec, max.	3℃/sec, max.
Liquidus temperature (TL)		183℃	217℃
Keep time above TL		60~ 90 seconds	60~ 90 seconds
Package peak temperature Tp		Users must not exceed the temperature stated on the product's "Moisture Sensitivity" label.	Users must not exceed the temperature stated on the product's "Moisture Sensitivity" label.
The time (Tp) within 5°C of the specified classification temperature (Tc) is shown in the figure below.		20 seconds	30 seconds
Cooling slope (Tp~TL)		6℃/sec, max.	6℃/sec, max.
Time from room temperature to peak temperature		6 minutes, longest	8 minutes, longest
※The peak temperature (Tp) tolerance of the temperature curve is defined as the upper limit of the user			

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6.2 Reflow Oven Curve



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Chapter 7 Related Models

Product Model	Chip Solution	Operating frequency	Test distance	Product size	Package
		Hz	m	mm	
E83-2G4M03S	nRF5340	2.4 G	170	16.0*16.0	Patches

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Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-5-20	Initial release	ALL

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