



JIASHI Communication Co.,Ltd.

JS-BTM235E

JIASHI Bluetooth Module Data Sheet

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Revision History

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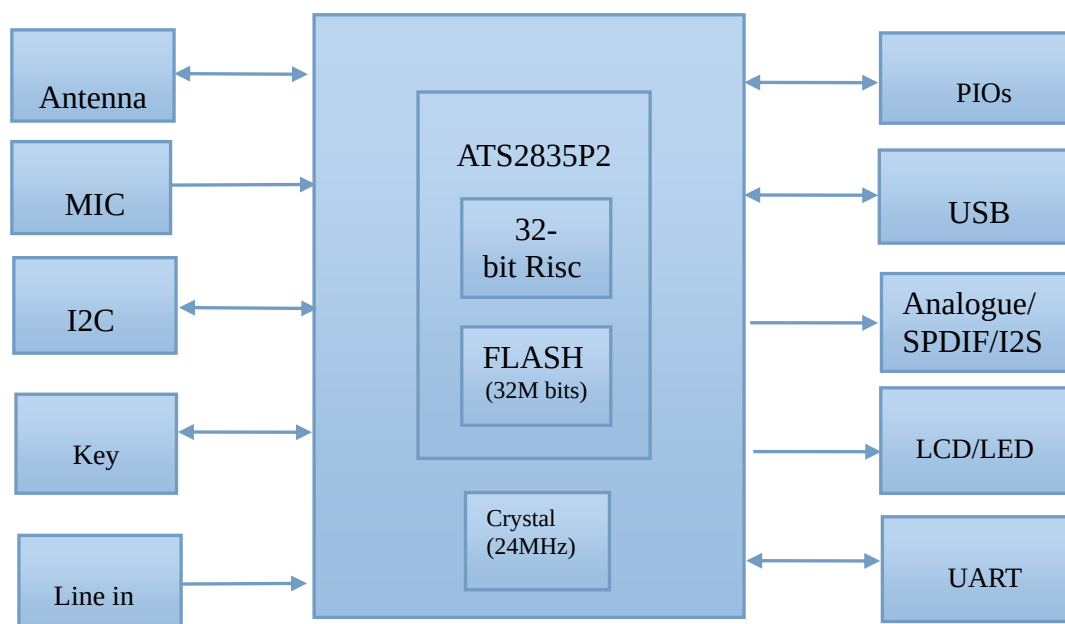
1. INTRODUCTION

JS-BTM235E is a highly integrated single-chip Bluetooth Audio solution. Positioning at Bluetooth portable stereo speakers, headsets and speakerphones and local MMC/SD Card Audio Playback market, JS-BTM235E satisfies the market requirements with high performance, low cost and low power consumption.

JS-BTM235E adopts CPU + DSP dual core architecture. Large capacity RAM is embedded to meet different Bluetooth applications, and support Bluetooth background working while playing high quality music with traditional plug-in card and USB flash disk. JS-BTM235E supports decoding Bluetooth A2DP audio and loading sound effects simultaneously, support Bluetooth handfree calls with dual MIC AEC and noise reduction.

JS-BTM235E integrates Bluetooth controller support V6.0 and compliant with V5.4/5.3/5.2/5.0 /4.2/2.1 Bluetooth specification, and supports dual mode (BR/EDR + Low Energy Controllers). The links in BR/EDR and LE can be active simultaneously. JS-BTM235E takes special methods at power optimization, especially for various applications scenarios, including sniff, Bluetooth idle, Bluetooth playing and call modes. Embedded PMU supports power optimization and provide long battery life. The competitive advantages of JS-BTM235E are high music and call qualities with low power and BOM, which lays the foundation for our goal at high-end market. Above all, JS-BTM235E provides a true “ALL-IN-ONE” solution, making it the ideal choice for highly integrated and optimized Bluetooth audio products.

1.1 Block Diagram





1.2 Features

- ✓ Small overall dimension (31 * 15 * 2.5 mm)
- ✓ Supports Dual-mode Bluetooth V6.0 with LE audio
- ✓ Internal 32M bits 4xIO SPI serial Flash for custom defined software
- ✓ Internal 32KB CPU ICache for SPI NorFlash
- ✓ Up to 16MB extensional pSRAM to support rich and flexible software feature
- ✓ Supports 24MHz OSC with on-chip PLL
- ✓ Supports for echo cancellation, noise reduction and wind noise reduction
- ✓ Max transmitting output power: 11dBm
- ✓ Compatible with AVRCP Profile V1.6.2, A2DP Profile V1.4,HFP Profile V1.9
- ✓ Support for SBC & AAC & LC3 Bluetooth audio transmission format
- ✓ Support LE Audio: Unicast, Auracast,CIS,BIS
- ✓ Compatible with TMAP,PBP Profile
- ✓ Supports all packet types in basic rate and enhanced data rate
- ✓ Supports SCO/eSCO link
- ✓ Built-in stereo 24 bit input sigma-delta DAC
- ✓ Supports Secure Simple Pairing
- ✓ Supports Low Power Mode (Sniff / Sniff Sub-rating / Hold / Park)
- ✓ Bluetooth Dual Mode support: Simultaneous LE and BR / EDR
- ✓ Supports multiple Low Energy states
- ✓ Fast AGC control to improve receiving dynamic range
- ✓ Supports AFH to dynamically detect channel quality to improve transmission quality
- ✓ Integrated Class1 PA
- ✓ Supports Li-Ion battery and 5V power supply

※ *Some features are optional for customization on demand.*



1.3 Application

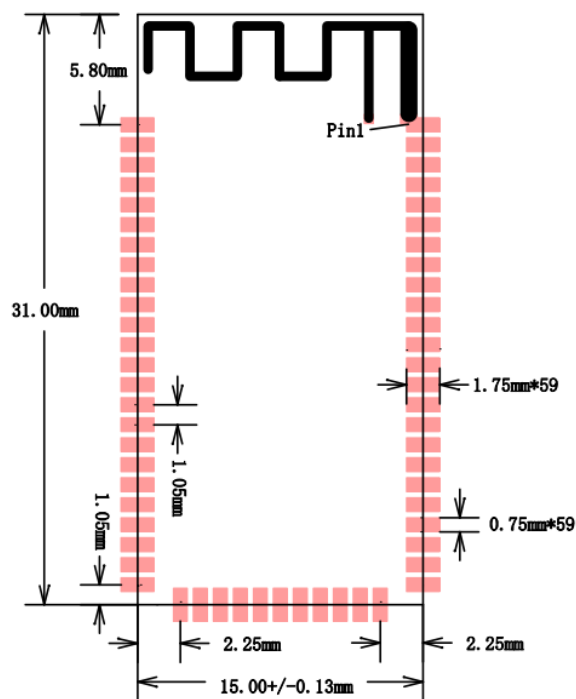
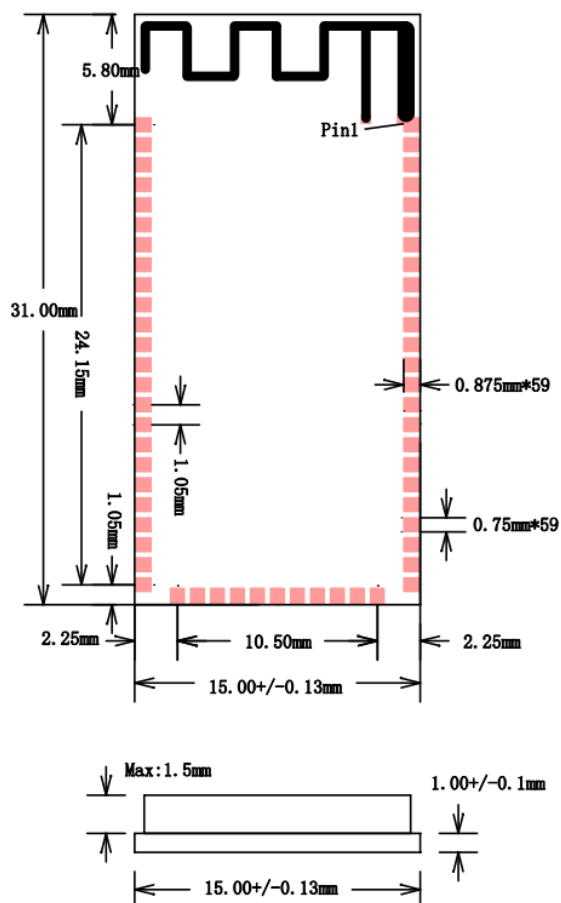
- ✓ Portable stereo speakers and speakerphones
- ✓ Bluetooth car audio unit
- ✓ Stereo headsets and headphone
- ✓ Other Bluetooth audio applications



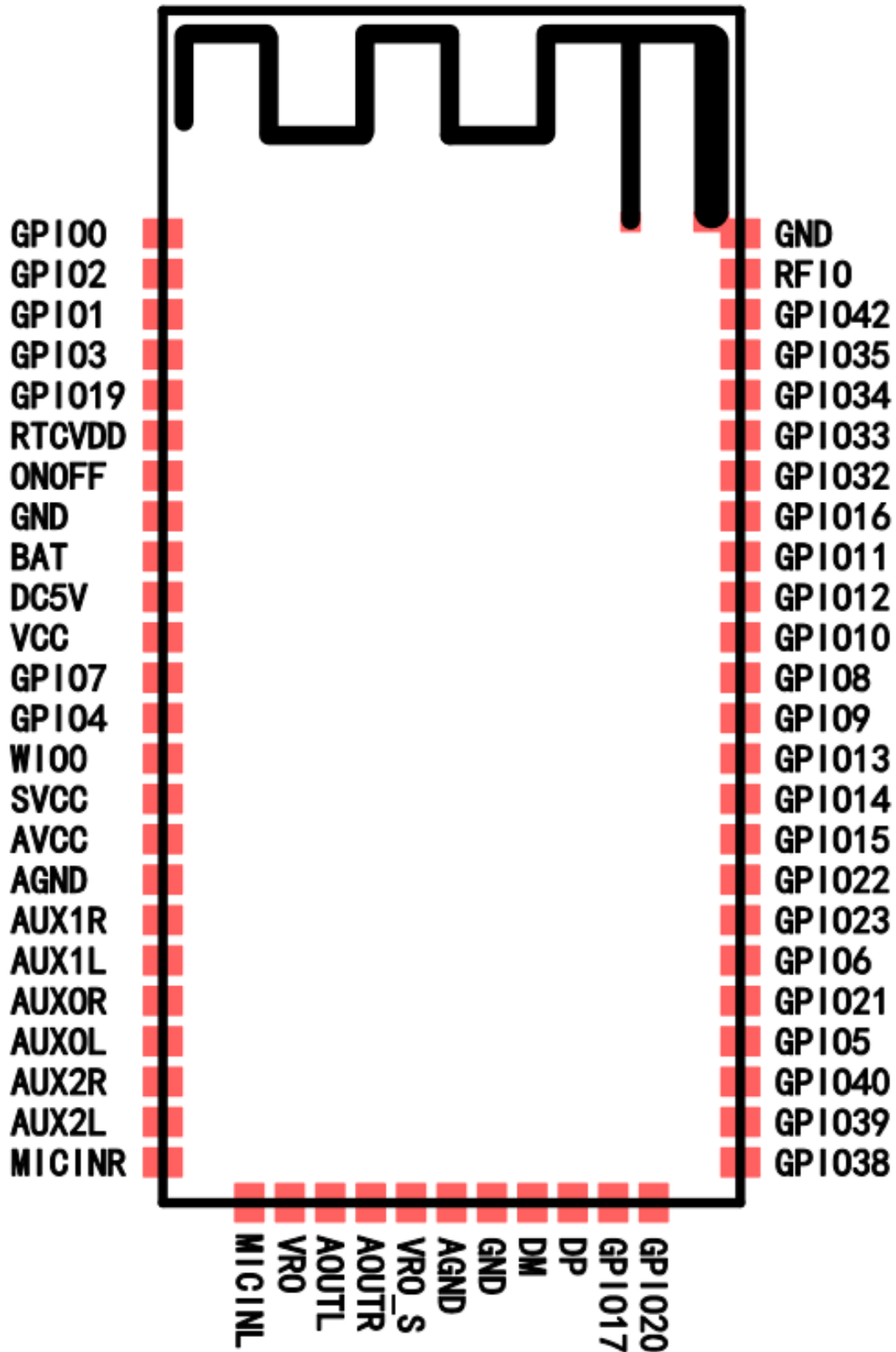
2. GENERAL SPECIFICATION

Bluetooth Specification	
Chip Set	ATS2835P2
Module ID	JS-BTM235E
BT Standard	Bluetooth® V6.0 specification
RF TX Output Power	-6~10dBm (typical)
RX Sensitivity	-90dBm (typical)
Frequency Band	2.402GHz~2.480GHz ISM Band
Modulation Type	GFSK, $\pi/4$ DQPSK, 8DPSK
Channel No.	79(for Classic), 40(for BLE)
Baseband Crystal OSC	24MHz
Hopping	1600hops/sec, 1MHz channel space
RF Input Impedance	50 ohms
Environmental	RoHS Compliant

3. PHYSICAL CHARACTERISTIC



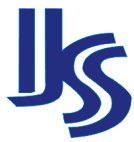
PCB Layout TOP VIEW
Recommended Soldering Footprint



3.1 Pin Description

Pin#	Pin Name	Pad Type	Description (Function Multiplex)
1	GND	GND	GND
2	RFIO	RF	Bluetooth antenna IO
3	GPIO42	DIO	TWI_SCL / PWM3 / PWM5 / I2STX0_BCLK / I2SRX0_BCLK / I2SRX1_BCLK / SD0_CLK0 / IR_RX / UART1_TX / SD1_DAT1
4	GPIO35	DIO	SPDIF_TX / LCD_SEG25 / I2STX0_DOUT / I2SRX0_DIN / I2SRX1_DIN
5	GPIO34	DIO	LCD_SEG24 / I2STX0_LRCLK / I2SRX0_LRCLK / I2SRX1_LRCLK / BT_REQ
6	GPIO33	DIO	LCD_SEG23 / I2STX0_BCLK / I2SRX0_BCLK / I2SRX1_BCLK
7	GPIO32	DIO	LCD_SEG22 / I2STX0_MCLK / I2SRX0_MCLK / I2SRX1_MCLK / VMIC
8	GPIO16	DIO	SPI2_SS / LCD_SEG14 / SPI1_SS / PWM4 / UART0_RX / Timer2_cap / SD0_CMD
9	GPIO11	DIO	LED_SEG3 / LCD_D3 / LCD_SEG5 / SPI1_MOSI / PWM6 / UART0_RTS / LRADC8 / SPI2_MOSI / Timer3_cap / SD1_DAT1 / BT_ACCESS
10	GPIO12	DIO	LED_SEG4 / LCD_D4 / LCD_SEG6 / SPI1_IO2 / PWM7 / LRADC9 / Timer2_cap / SD1_DAT2
11	GPIO10	DIO	LED_SEG2 / LCD_D2 / LCD_SEG4 / SPI1_MISO / PWM5 / UART0_CTS / LRADC7 / SPI2_MISO / Timer2_cap / SD1_DAT0
12	GPIO8	DIO	LED_SEG0 / LCD_D0 / LCD_SEG2 / SPI1_SS / PWM3 / LRADC5 / SPI2_SS / Timer2_cap / SD1_CLK
13	GPIO9	DIO	LED_SEG1 / LCD_D1 / LCD_SEG3 / SPI1_CLK / PWM4 / LRADC6 / SPI2_CLK / Timer3_cap / SD1_CMD
14	GPIO13	DIO	LED_SEG5 / LCD_D5 / LCD_SEG7 / SPI1_IO3 / PWM8 / UART1_RTS / LRADC10 / Timer3_cap / SD1_DAT3
15	GPIO14	DIO	LED_SEG6 / LCD_D6 / LCD_SEG8
16	GPIO15	DIO	LED_SEG7 / LCD_D7 / LCD_SEG9 / SPI1_IO3 / PWM4 / UART1_RX / I2STX0_MCLK / I2SRX0_MCLK / I2SRX1_MCLK / Timer3_cap / SD1_DAT0
17	GPIO22	DIO	LCD_D10 / LCD_SEG12 / IR_RX / PWM1 / UART0_TX / LRADC2 / I2STX0_LRCLK / I2SRX0_LRCLK / I2SRX1_LRCLK / Timer2_cap / SD1_DAT2 / UART1_RX / SD0_DAT2
18	GPIO23	DIO	LCD_D11 / LCD_SEG13 / SPDIF_TX / PWM2 / UART0_TX / LRADC3 / I2STX0_BCLK / I2SRX0_BCLK / I2SRX1_BCLK / Timer3_cap / SD1_CMD / SD0_DAT3 / SD0_DAT0
19	IPO06	DIO	LED_COM6 / BT_ACCESS / LCD_SEG0 / PWM4 / I2STX0_LRCLK / I2SRX0_LRCLK / I2SRX1_LRCLK / Timer2_cap / SD1_DAT0

20	GPIO21	DIO	SPI2_MOSI / LCD_D9 / LCD_SEG11 / SPI1_MOSI / PWM0 / UART0_RX / TEMPADC / I2STX0_MCLK / I2SRX0_MCLK / I2SRX1_MCLK / Timer3_cap SD1_CLK / UART1_TX / SD0_DAT1
21	IPO05	DIO	LED_COM5 / BT_REQ / LCD_COM5 / PWM3 / Timer3_cap
22	GPIO40	DIO	PTA_GRANT / LCD_SEG30 / PWM2 / I2STX0_MCLK / I2SRX0_MCLK / I2SRX1_MCLK
23	GPIO39	DIO	BT_ACCESS / LCD_SEG29 / PWM1 / I2STX0_BCLK / I2SRX0_BCLK / I2SRX1_BCLK
24	GPIO38	DIO	SPDIF_RX / BT_REQ / LCD_SEG28 / PWM0 / I2STX0_DOUT / I2SRX0_DIN / I2SRX1_DIN
25	GPIO20	DIO	SPI2_MISO / LCD_D8 / LCD_SEG10 / SPI1_MISO / PWM2 / UART1_CTS / Timer2_cap / SD0_DAT0 / VMIC
26	GPIO17	DIO	SPI2_CLK / LCD_SEG15 / SPI1_CLK / UART0_TX / Timer3_cap / SD0_CLK0
27	DP	AIO	USB Data plus
28	DM	AIO	USB Data minus
29	GND	GND	GND
30	AGND	GND	GND for PA
31	VRO_S	AO/DIO	Right channel differential output and direct drive circuit reference voltage
32	AOUTR	AO/DIO	Right channel output and right channel differential output
33	AOUTL	AO/DIO	Left channel output and left channel differential output
34	VRO	AO/DIO	Left channel differential output and direct drive circuit reference voltage
35	MICINL	AI/DIO	Microphone left channel input Differential MICIN Positive Input
36	MICINR	AI/DIO	Microphone right channel input Differential MICIN Positive Input
37	AUX2L	AI/DIO	Linein/FM left channel input2
38	AUX2R	AI/DIO	Linein/FM right channel input2
39	AUX0L	AI/DIO	Linein/FM left channel input0, left channel differential input
40	AUX0R	AI/DIO	Linein/FM right channel input0, left channel differential input
41	AUX1L	AI/DIO	Linein/FM left channel input1, right channel differential input
42	AUX1R	AI/DIO	Linein/FM right channel input1, right channel differential input
43	AGND	GND	Analog GND



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44	AVCC	PWR	Analog IO PWR
45	SVCC	PWR	PWR for standby
46	WIO0	DIO	Wake up I/O port EXT_32K_IN / HOSC / LRADC1
47	GPIO4	DIO	LED_COM4 / LCD_CEB / LCD_COM4 / PWM1 / Timer2_cap / IR_RX / VMIC
48	GPIO7	DIO	LED_COM7 / PTA_GRANT / LCD_SEG1 / SPDIF_RX / PWM0 / UART1_TX / FMCLKOUT / I2STX0_DOUT / I2SRX0_DIN / I2SRX1_DIN / Timer3_cap / SD1_DAT3
49	VCC	PWR	Digital IO PWR
50	DC5V	PWR	5.0V Voltage
51	BAT	PWR	Battery Voltage input
52	GND	GND	GND
53	ONOFF	AI	ON/OFF reset signal
54	RTCVDD	PWR	RTC power
55	GPIO19	DIO	Bit19 of General purpose I/O port LCD_SEG17 / TWI_SDA / Timer3_cap
56	GPIO3	DIO	LED_COM3 / LCD_CEB / LCD_COM3 / SPI1_CLK / UART0_TX / I2STX0_DOUT / I2SRX0_DIN / I2SRX1_DIN / Timer3_cap / SPI2_CLK
57	GPIO1	DIO	LED_COM1 / LCD_RS / LCD_COM1 / TWI_SDA / PWM3 / UART0_CTS / I2STX0_BCLK / I2SRX0_BCLK / I2SRX1_BCLK / Timer3_cap / SPI2_MISO
58	GPIO2	DIO	LED_COM2 / LCD_RDB / LCD_COM2 / SPI1_MOSI / PWM2 / UART0_RX / LRADC4 / I2STX0_LRCLK / I2SRX0_LRCLK / I2SRX1_LRCLK / Timer2_cap / SPI2_MOSI
59	GPIO0	DIO	LED_COM0 / LCD_WRB / LCD_COM0 / TWI_SCL / PWM1 / UART0_RTS / I2STX0_MCLK / I2SRX0_MCLK/ I2SRX1_MCLK

Rating	Symbol	Min	Max	Unit
Ambient Temperature	Tamb	-25	85	°C
Storage temperature	Tstg	-55	+150	°C
ESD Stress voltage	Vesd (Human body model)	4000	-	V
Supply Voltage	DC5V	-0.3	9	V
	BAT	-0.3	5	V
	VCC/AVCC/SVCC	-0.3	3.6	V
	VDD	-0.3	1.32	V
Input Voltage	3.3V IO	-0.3	3.6	V
	1.2V IO	-0.3	1.32	V

4.ELECTRICAL CHARACTERISTIC

4.1 Absolute maximum ratings

4.2 Recommended power supply

Rating	Min	Typ	Max	Unit
BAT(Li)	3.4	3.8	4.5	V
DC5V	4.5	5.0	7.0	V
VCC/AVCC/SVCC	2.8	3.1	3.4	V
VDD/RTCVDD	1.08	1.2	1.32	V
VREF	--	1.5	--	V
ONOFF	--	--	1.32	V

4.3 Regulators maximum output current

The output voltages are precisely within $\pm 5\%$, providing maximum output currents when voltages drop to 95%. Table7-1 shows data of maximum output current.

Block name	Output Voltage	Load capacity
VCC	2.7~3.4V	300mA
AVCC	VCC-0.15V	50mA
VDD	0.8~1.5V	70mA

4.3.1 Regulators Power Down

If the system is to operate from an external power supply, then the internal linear regulators are powered down automatically.

4.3.2 Reference Voltage

There is a build-in 1.5V-reference voltage output—VREFI.

4.3.3 A/D Converters

There are 10 bits A/Ds for system monitor, the input voltage range of which is 0V to SVCC @ LRADC2~11 pin, 1.1V to 4.8V at VBAT pin, 0V to 6.0V at DC5V pin, 0V to SVCC at LRADC1 pin, -40~120°C for temp sensor.

For LRADC1~11, $1\text{LSB} = 3.6\text{V}/(2^{10}) = 3.52\text{mV}$;

For BATADC, $1\text{LSB} = 4.8\text{V}/(2^{10}) = 4.69\text{mV}$;

For DC5V, $1\text{LSB} = 6\text{V}/(2^{10}) = 5.86\text{mV}$;

For SENSADC, $T = 160/1024 * \text{data (decimal)} - 40^{\circ}\text{C}$;

When the input voltage is V, the related ADC data $n = V/(3.6/2^{10})$.

4.4 Audio ADC Parameters

Pre-Amplifier						
Parameter	Conditions		Min	Typ	Max	Unit
Full Scale Input Voltage	THD+N \< 1%		-	-	2.8	Vpp
Analogue gain	AUX OP	-	-12	-	7.5	dB
	MIC OP	Single Ended	26	-	39	dB
		Full Differential	32	-	45	dB
Analogue to Digital Converter						
Resolution	-		-	-	24	Bits
Input Sample Rate	-		8	-	48	kHz
SNR	fin = 1kHz@Full Scale Input Voltage B/W = 22Hz~22kHz Fs=48kHz		-	96	-	dB
Dynamic Range	fin = 1kHz@-40dBFS Input Voltage B/W = 22Hz~22kHz Fs=48kHz		-	94	-	dB
THD+N	fin = 1kHz(input=1.6Vpp) B/W = 22Hz~22kHz Fs=48kHz		-	-85	-	dB
Digital gain	-		0	-	45	dB

4.5 Stereo DAC Parameters

Digital to Analogue Converter						
Parameter	Conditions		Min	Typ	Max	Unit
Resolution	-		-	-	20	Bits
Output Sample Rate	-		8	-	48	kHz
SNR	fin = 1kHz@0dBFS input B/W = 22Hz~22kHz Fs=48kHz,Load=16Ω	-	-	98	-	dB
		A - Weighting	-	101	-	dB

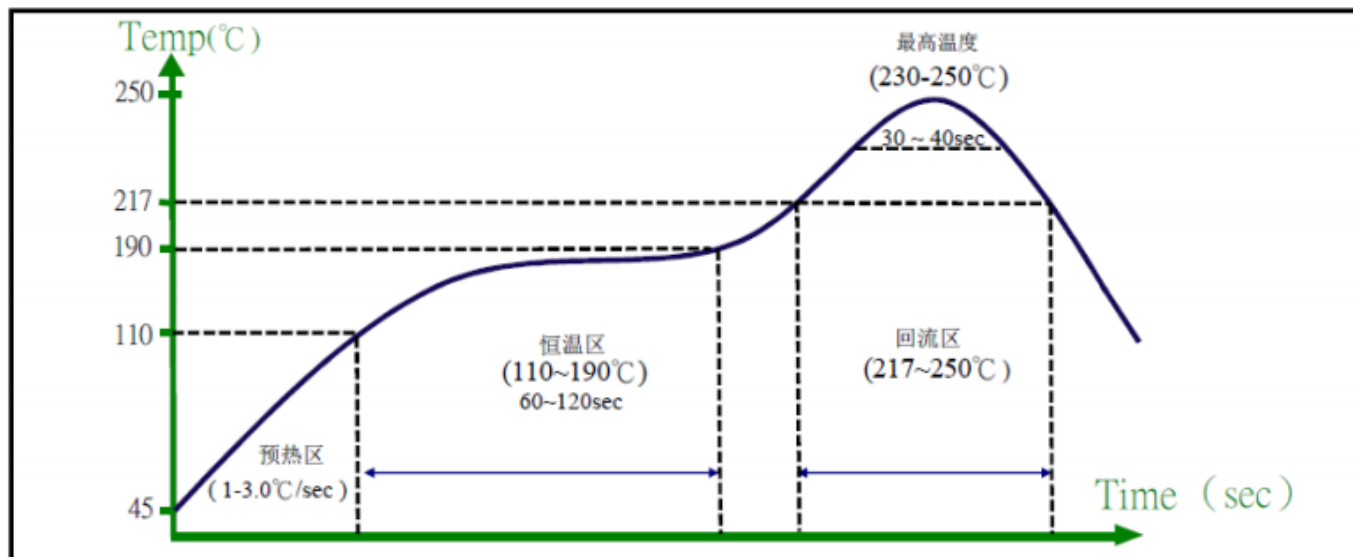
Dynamic Range	fin = 1kHz@-48dBFS input B/W = 22Hz~22kHz Fs=48kHz, Load=16Ω	-	-	98	-	dB
		A - Weighting	-	101	-	dB
THD+N	fin = 1kHz@0dBFS input B/W = 22Hz~22kHz Fs=48kHz, Load=16Ω	-	-	-87	-	dB
Digital gain	-		<-98	-	24	dB
Stereo crosstalk	fin = 1kHz@0dBFS input	-	-	-78	-	dB
PWR Amplifier						
Analogue gain	-		-98	-	0	dB
Max Amplitude/PWR	fin = 1kHz@0dBFS input Fs=48kHz, Load=16Ω	Single Ended	-	-	536	mVrms
		Output	-	-	18	mW
	fin = 1kHz@0dBFS input Fs=48kHz, Load=16Ω	Direct drive	-	-	536	mVrms
		Output	-	-	18	mW
	fin = 1kHz@0dBFS input Fs=48kHz, Load=10Ω	Full Differential Output	-	-	1.82	Vrms

4.6 RF characteristics

Receiver		Average	Bluetooth Spec	Transmitter		Average	Bluetooth Spec	Unit
Sensitivity at 0.1 BER	2402MHz	-90	<=-70	Output Power	2402MHz	7.2	-6~+10	dBm
	2441MHz	-90			2441MHz	7.2		dBm
	2480MHz	-90			2480MHz	7.2		dBm

5. REFLOW PROFILE

Reflow number of times: ≤ 2 times



温度范围与要求

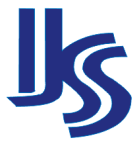
1. 预热区: 60~90°C以下, 升温率1 - 3.0°C/sec
2. 恒温区: 110~190°C时间为 60 - 120sec
3. 217°C以上: 30 - 90sec
4. 230°C - 250°C 时间为 30 ~40sec
5. 最高温度: 230°C - 250°C.



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6. PACKAGING INFORMATION

1. BLUETOOTH® Module: JS-BTM235E



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Responsible Party Name : Empower Tribe Innovations US Inc.

Address: 901 Grier Dr. Las Vegas, NV, 89119, USA

Email address: legal@musictribe.com

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.

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

- a. This device may not cause harmful interference, and
- b. This device must accept any interference received, including interference that may cause undesired operation.

Important information:

Changes or modifications to the equipment not expressly approved by Music Tribe can void the user's authority to use the equipment.

Caution!

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modification to this equipment. Such modifications could void the user authority to operate the equipment.

FCC RF Radiation Exposure Statement:

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

Caution!

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.



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This equipment complies with IC 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.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Cet appareil est conforme à IC l'exposition aux rayonnements limites fixées pour un environnement non contrôlé. Cet appareil doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps. Cet transmetteur ne doit pas être co-situé ou opérant en liaison avec toute autre antenne ou transmetteur.