



Smartlink Technology

TWS200

Datasheet

Bluetooth 5.2 HD Audio AI SOC

Version: 0.2

May 10th, 2021

Revision History

Version	Date	Description
0.1	December 2020	Initial release.
0.2	May 2021	Spec updated.

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1 General description

TWS200 is a Bluetooth 5.2 dual-mode audio SOC mainly for TWS FF ANC and voice AI application. It includes high performance RISC processor, BT/BLE dual-mode radio, FF ANC processor, low-power VAD, 24-bit high-performance audio codecs, advanced power management unit, Li-ion battery charger, embedded flash, and flexible interfaces including USB, I2S, I2C, UART, PWM and programmable input/output.

TWS200 is a high performance & low-power solution for TWS ANC and voice AI products.

2 Features

Processor

- 32-bit RISC Processor
- Up to 336MHz
- Supports DSP instructions
- Supports floating point instructions

Bluetooth

- Bluetooth V5.2 dual mode
- Supports BR/EDR, BLE 1/2M
- Supports LE isochronous channel
- TX power up to 10dBm
- RX sensitivity:
 - BR@-97dBm;
 - EDR@-96dBm;
- Multi-link up to 7 active ACL links
- Supports A2DP/AVRCP/HFP/HSP/SPP/Etc. profiles

Audio/Voice Processing

- FF ANC
- Multi-MIC AI AENC
- Low power VAD
- Key word spotting and voice command
- HW EQ and ASRC

Audio Codec

- High performance 24-bit audio codecs
 - ADC x 2: 95dB SNR; -85dB THD+N
 - DAC x 1: 100dB SNR; -93dB THD+N
- Supports triple analog mic inputs
- Integrated headphone drivers

Peripherals

- Full speed USB2.0 OTG
- 1/2/4 SPI Flash CTL with cache
- I2S/UART/I2C/PWM/SPI
- GPIOs

PMU

- Integrated Li-ion Battery charger
- Integrated DCDC and LDOs
- Supports brown-out protection
- Supports over-charge protection

System

- Internal RC OSCs
- RTC/Timer/TRNG/DMA
- Key-ADC/DKC
- 128bit E-fuse
- 8Mb serial Flash embedded

Package:

- QFN32L 4x4 with 0.4 pin pitch
- Green (RoHS compliant and no antimony or halogenated flame retardants)

Temperature:

- Operating: -30°C ~ 85°C
- Storage: -40°C ~125°C

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3 Block Diagram

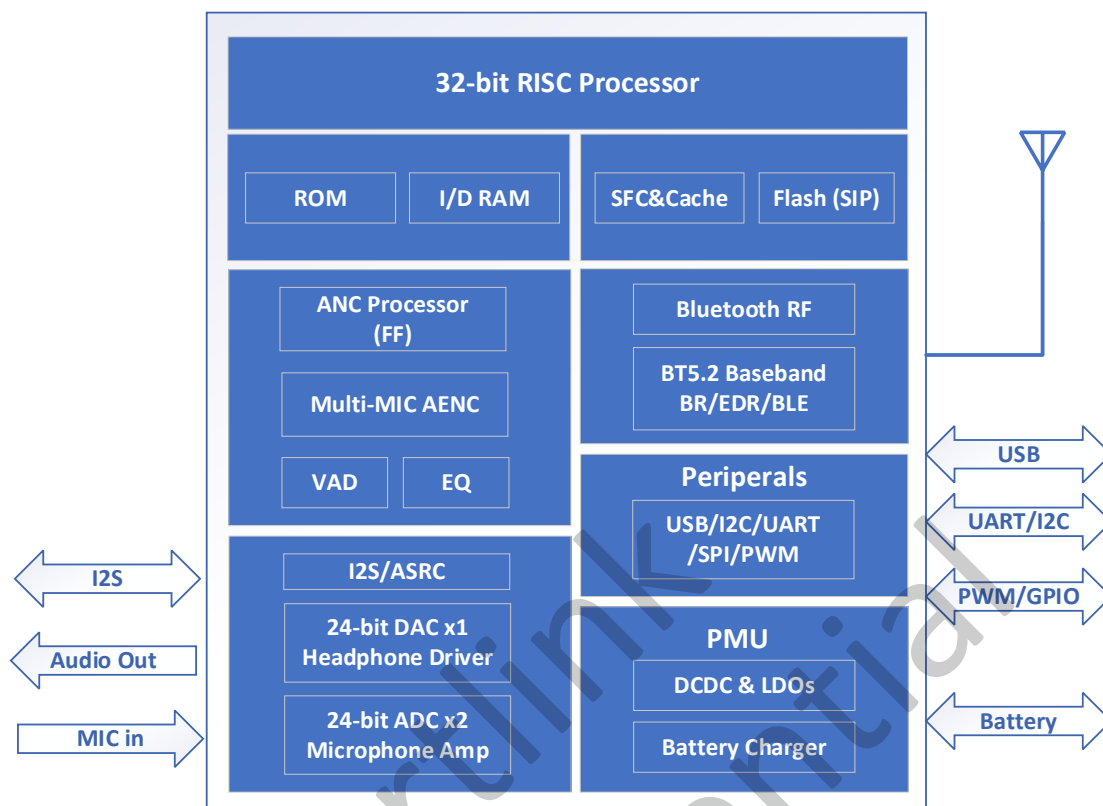


Figure 3-1 TWS200 Block Diagram

4 Pin Assignment

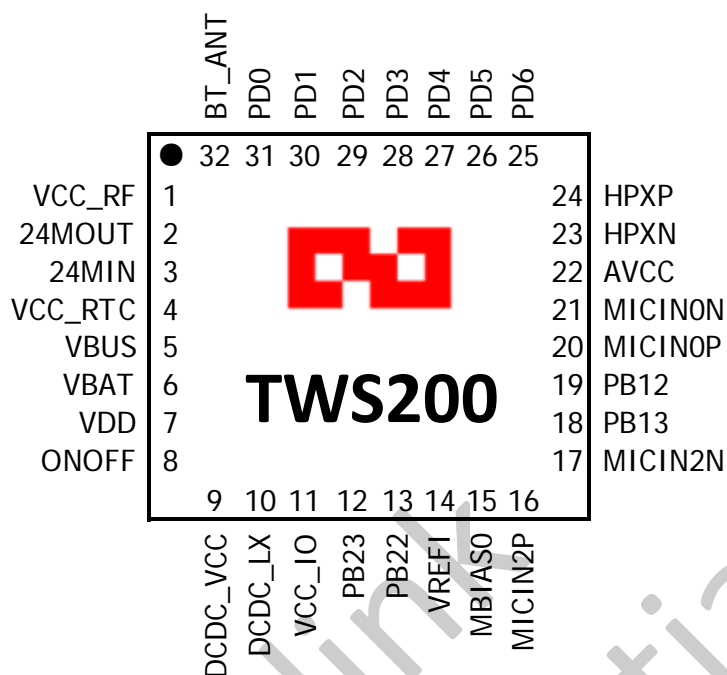


Figure 4-1 TWS200 Pinout

5 Pin Description

PIN#	PIN NAME	TYPE	Description	Power Domain
1	VCC_RF	P	RF power	/
2	24MOUT	A	24MHz Crystal Output	/
3	24MIN	A	24MHz Crystal Input	/
4	VCC_RTC	P	RTC power	/
5	VBUS	P	Charge input	/
6	VBAT	P	Battery input/charge output	/
7	VDD	P	Digital core power	/
8	ONOFF	I	Power on/off key	VBAT
9	DCDC_VCC	P	DCDC power input	/
10	DCDC_LX	P	DCDC switch mode output	/
11	VCC_IO	P	IO Power	/
12	PB23	IO	PB23/SWDIO_0/UART1_TX/DMIC_DATA1/PWM3/UART0_RX/I2C0_SDA/I2CS_SDA/SIC_SDA/T0/SWDIO_1/UART2_RX/I2S0_D0/USB0-DM	VCC-IO

PIN#	PIN NAME	TYPE	Description	Power Domain
13	PB22	IO	PB22/SWCLK_0/UART1_RX/DMIC_CLK/PWM2/UART0_TX/I2C0_SCK/I2CS_SCK/SIC_SCLK/SWCLK_1/UART2_TX/I2S0_BCLK/USB0-DP	VCC-IO
14	VREF1	A	Decoupling of analog reference	AVCC
15	MBIAS0	A	MIC BIAS	AVCC
16	MICIN2P	A	MIC2 input positive pin	/
17	MICIN2N	A	MIC2 input negative pin	AVCC
18	PB13	I/O	PB13/DMIC_DATA1/I2C0_SCK/I2S0_LRCK/UART1_RX/SPI1_CS/I2S0_D5/I2CS_SDA/UART1_CTS/I2S0_LRCK1/SIC_SDAT0/H_CEC/BT_T7	VCC-IO
19	PB12	I/O	PB12/DMIC_CLK/UART2_TX/I2S0_D1/UART1_TX/SPI1_MISO/I2S0_D4/I2CS_SCK/SPI1_MOSI/I2C0_SDA/SIC_SCLK/IR_Rx/BT_T6	VCC-IO
20	MICIN0P	A	MIC0 input positive pin.	AVCC
21	MICIN0N	A	MIC0 input negative pin	AVCC
22	AVCC	P	Power for audio codec	/
23	HPXN	A	Speaker output negative pin	AVCC
24	HPXP	A	Speaker output positive pin	AVCC
25	PD6	I/O	PD6/SPI1_MISO/I2S0_MCLK/UART1_TX/I2S0_LRCK/I2C0_SDA/UART2_RTS/DMIC_DATA0/I2CS_SDA/PWM3/UART0_RX/KEYADC5	VCC-RTC
26	PD5	I/O	PD5/SPI1_CLK/I2S0_BCLK/UART1_RX/I2S0_BCLK1/I2C1_SDA/PWM2/DMIC_CLK/I2CS_SCK/UART0_TX/KEYADC4	VCC-RTC
27	PD4	I/O	PD4/SPI1_MOSI/I2S0_D1/SPDIF_IN_B/I2S0_LRCK1/I2C1_SCK/I2S0_MCLK/DMIC_DATA1/COREPLL_REFOUT/COREPLL_INFOUT/KEYADC3	VCC-RTC
28	PD3	I/O	PD3/SPI1_MISO/I2S0_D0/UART1_RX/I2S0_BCLK1/I2C0_SCK/I2C1_SDA/DMIC_CLK/H_CEC/PWM4/KEYADC2	VCC-RTC
29	PD2	I/O	PD2/SPI1_CS/I2S0_LRCK/UART1_TX/I2S0_LRCK1/I2C0_SDA/DMIC_CLK/DMIC_DATA0/SPDIF_IN_B/PWM5/I2S0_MCLK_IN	VCC-RTC
30	PD1	I/O	PD1/SPI1_CS/I2S0_D0/UART2_TX/I2S0_BCLK/I2C0_SCK/SPDIF_IN_A/DMIC_DATA1/UART1_RX/PWM1/UART0_RX	VCC-RTC
31	PD0	I/O	PD0/SWD_SELECT/I2S0_LRCK/UART2_TX/PWM0/SPDIF_IN_B/PLL_TEST/DMIC_CLK/DKCO/UART2_RX/I2C0_SDA/UART0_TX/KEYADC1	VCC-RTC
32	BT_ANT	A	RF antenna	/

6 Electrical Characteristics

6.1 Absolute Maximum Ratings

The Recommended Operating Conditions are as follows. Functional operation of the device at any other conditions is not implied. Exposure to absolute maximum rated conditions for extended periods may suffer irreversible damage to the device.

SYMBOL	PARAMETER	MIN	MAX	UNIT
Tstg	Storage Temperature	-40	150	°C
VBUS	Charge input voltage	-0.3	6.3	V
VBAT	Battery input voltage	-0.3	4.6	V
I_vccio	VCCIO output power	/	150	mA

6.2 Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
Ta	Operating Temperature	-30	20	85	°C
VBUS	Power supply for charger	4.6	5	5.8	V
VBAT	Power supply for SoC	2.7	3.7	4.4	V
VCC-IO	Power supply for IO	2.7	3.3	3.4	V
AVCC	Power supply for audio	2.7	3.3	3.4	V

6.3 DC Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
Vih	High-level input Voltage	0.7*VCC-IO	/	VCC-IO+0.3	V
Vil	Low-level input Voltage	-0.3	/	0.3*VCC-IO	V
Rpu(a)	pull-up resistance	50K	100K	150K	Ω
Rpd(a)	pull-down resistance	50K	100K	150K	Ω
Rpu(b)	pull-up resistance	1K	2K	3K	Ω
Rpd(b)	pull-down resistance	1K	2K	3K	Ω

7 Package Information

7.1 QFN32L(4mm x 4mm 0.4pitch)

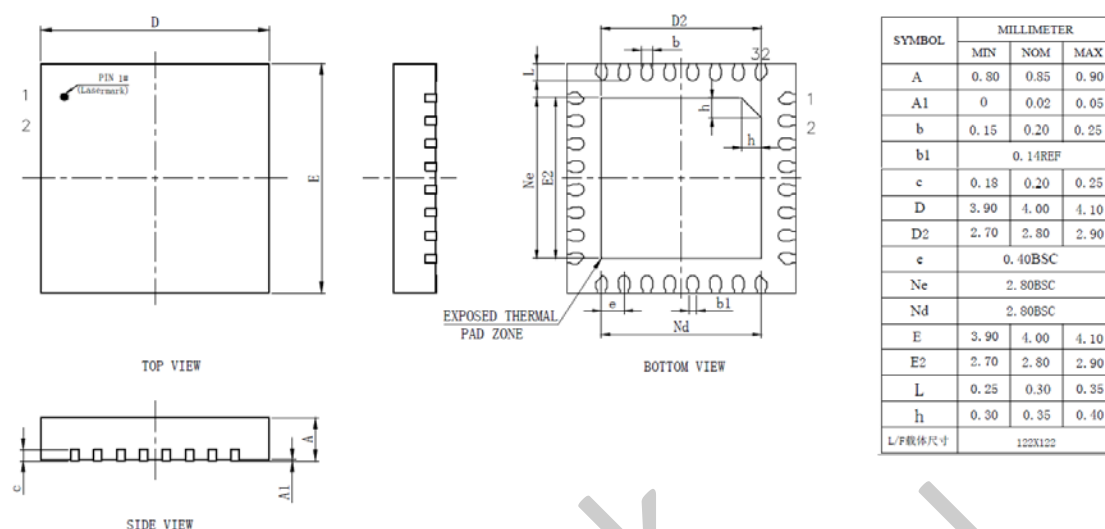


Figure 7-1 TWS200 Package

7.2 RoHS compliance

TWS200 meets the requirements of Directive 2011/65/EU of the European

Parliament and of the Council on the Restriction of Hazardous Substance (RoHS).

8.1 TWS FF ANC

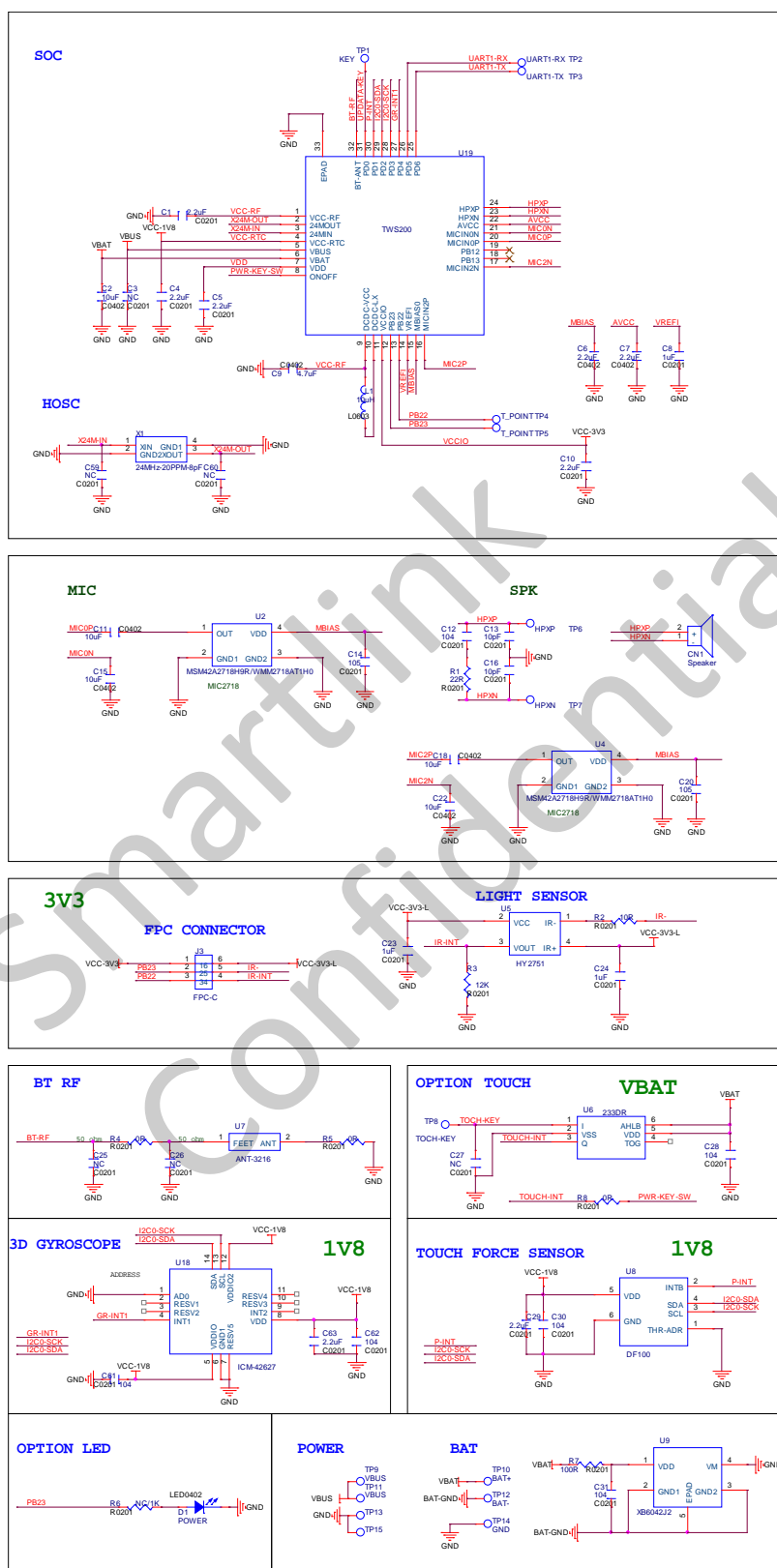


Figure 8-1 TWS example application schematic

ABOUT US

Smartlink technology Inc. is a professional intelligent wireless audio solution supplier. Founded in 2016, Smartlink technology gathered experts in audio processing, SOC design, RF design, system engineering and enthusiasts in semiconductor industry. With tacit teamwork and outstanding expertise, the core team has excellent records of full business chain operation and marketing success on numerous SOC products in years. Smartlink technology provides customers with complete solutions including SOC chips, audio and AI algorithms, and AIOT cloud service.

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