



WS300

Datasheet

2.4GHz & Bluetooth 5.2 AI Audio
SOC

Version: 0.4

Jan 20th, 2022

Revision History

Version	Date	Description
0.4	January 2022	Application schematic updated

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1 General description

WS300 is a 2.4GHz & Bluetooth 5.2 dual-mode audio SOC mainly for AI MIC and gaming applications, featured low-latency wireless transmission and rich sound effect processing. It includes high performance RISC processor, BT/BLE dual-mode radio, 24-bit high-performance audio codecs, advanced power management unit, Li-ion battery charger, embedded flash, SD/eMMC, SPI LCD interface, and other flexible interfaces including USB, I2S, I2C, UART, PWM and programmable input/output.

WS300 is a high performance & low-power solution for Bluetooth AI MIC and gaming products.

2 Features

Processor

- 32-bit RISC Processor architecture
- Up to 336MHz
- Supports DSP instructions
- Supports floating point instructions
- ADC x 3: 95dB SNR; -85dB THD+N
- DAC x 2: 100dB SNR; -88dB THD+N
- Supports two analog mic inputs
- Integrated headphone drivers

Bluetooth & 2.4GHz

- 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/AVCTP/AVDTP/AVRCP/HFP/HID/SPP/Etc. profiles

Audio/Voice Processing

- 1/2 -MIC AI AENC
- HW EQ and ASRC
- Reverberation/Auto tune/ Virtual Surround/Bass Boost/etc

Audio Codec

- High performance 24-bit audio codecs

Peripherals

- Full speed USB2.0 OTG
- 1/2/4 SPI Flash CTL with cache
- SD/TF/eMMC 1/4 wire mode up to 50MHz
- SPI 3/4 interface for LCD display
- 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:

- QFN52L 6x6 with 0.4 pin pitch
- Green (RoHS compliant and no antimony or halogenated flame retardants)

Temperature:

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

3 Block Diagram

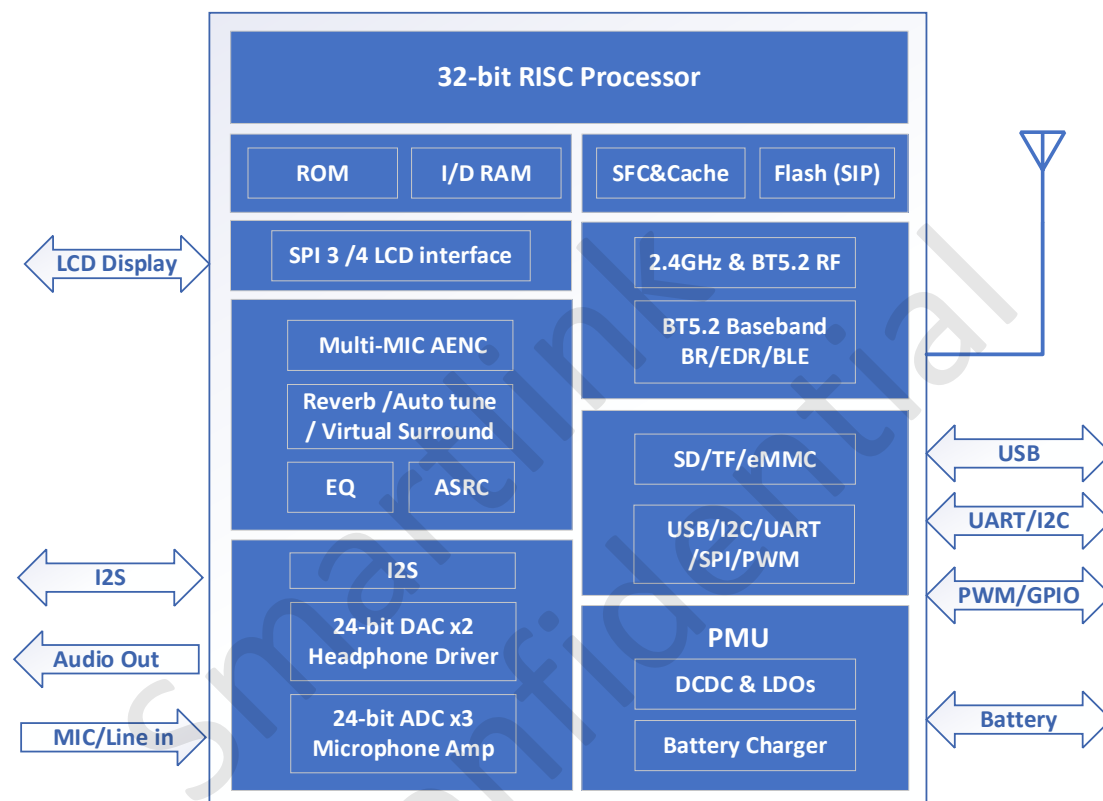


Figure 3-1 WS300 Block Diagram

4 Pin Assignment

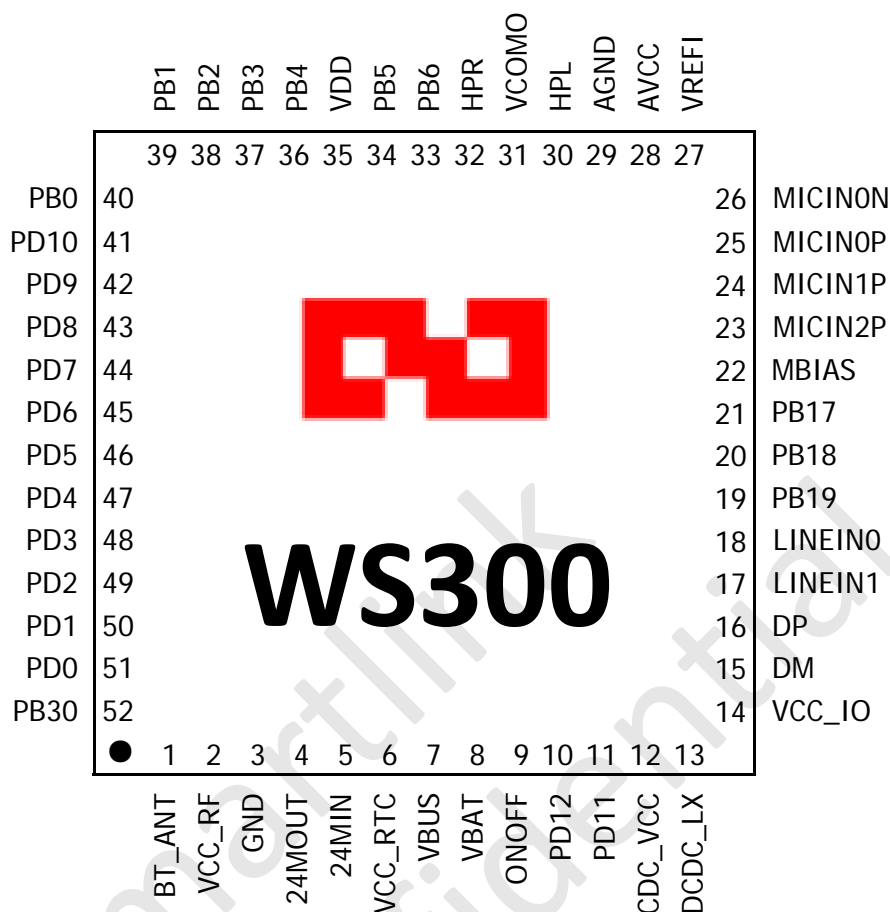


Figure 4-1 WS300 pinout

5 Pin Description

PIN#	PIN NAME	TYPE	Description	Power Domain
1	BT_ANT	A	RF antenna	/
2	VCC_RF	A	RF power	/
3	GND	P	Ground	/
4	24MOUT	P	24MHz Crystal Output	/
5	24MIN	P	24MHz Crystal Input	/
6	VCC_RTC	P	RTC power	/
7	VBUS	P	Charge input	/
8	VBAT	P	Battery input/charge output	/
9	ONOFF	I	Power on/off key	VBAT
10	PD12	I/O	PD12/UART0_RX/I2C0_SCK/IR_Rx/DKC0/I	VCC-IO

PIN#	PIN NAME	TYPE	Description	Power Domain
			2S0_D3/I2C0_SDA/SPI1_CLK/UART2_RX/UART0_TX/SDC0_D3/I2CS_SDA	
11	PD11	I/O	PD11/UART0_TX/FM_CLK/I2S0_D2/I2C0_SCK/SPI1_MISO/I2CS_SCK/PWM0/IR_Rx/DISPL_X_0	VCC-IO
12	DCDC_VCC	P	DCDC power input	/
13	DCDC_LX	P	DCDC switch node output	/
14	VCC_IO	P	IO Power	/
15	DM	A	USB-DM	VCC-IO
16	DP	A	USB-DP	VCC-IO
17	LINEIN1	A	Audio LINE IN 1	AVCC
18	LINEIN0	A	Audio LINE IN 0	AVCC
19	PB19	IO	PB19/PWM0/I2S0_D1/I2S0_D6/SPI1_MISO/UART2_CTS/UART1_RX/I2C0_SDA/I2CS_SDA/SPI1_CS/SIC_SDAT0/DISPL_X_5/AUXIN0	VCC-IO
20	PB18	IO	PB18/DMIC_DATA1/I2S0_MCLK/I2S0_D5/PWM5/UART2_RTS/UART1_TX/I2C0_SCK/I2CS_SCK/SPI1_CLK/SIC_SCLK/DISPL_X_4/AUXIN1	VCC-IO
21	PB17	IO	PB17/DMIC_CLK/I2S0_D0/I2S0_D4/PWM3/UART2_RX/UART1_CTS/I2C1_SDA/I2CS_SDA/SPI1_MOSI/SIC_SDAT0/DISPL_X_3/MICIN2	VCC-IO
22	MBIAS	A	MBIAS0	AVCC
23	MICIN2P	A	MICIN2P	AVCC
24	MICIN1P	A	MICIN1P	AVCC
25	MICIN0P	A	MICIN0P	AVCC
26	MICIN0N	A	MICIN0N	AVCC
27	VREFI	A	Analog reference	AVCC
28	AVCC	P	AVCC	/
29	AGND	P	AGND	/
30	HPL	A	Left channel audio output	AVCC
31	VCOMO	A	VCOMO	AVCC
32	HPR	A	Right channel audio output	AVCC
33	PB6	I/O	PB6/PWM4/I2S0_MCLK/UART0_TX/SWDIO_0/SPI1_CS/I2S0_D5/I2C1_SDA/SPI0_CLK/SIC_SCLK/DISPL_X_8/KEYADC9	VCC-IO
34	PB5	I/O	PB5/FM_CLK/I2S0_D0/UART0_RX/SWCLK	VCC-IO

PIN#	PIN NAME	TYPE	Description	Power Domain
			_0/SPI1_CLK/I2S0_D4/DKC2/SPIO_CS1_M OSI/ I2S0_LRCK1/DISPL_X_9 /KEYADC8	
35	VDD	P	Digital Core power	/
36	PB4	I/O	PB4/PWM0/DKC2/I2S0_MCLK/SPIO_CLK/S PI1_MOSI/UART0_TX/IR_Rx/FM_CLK/ I2C1_SCK/DISPL_X_10	VCC-IO
37	PB3	I/O	PB3/IR_Rx/DKC1/I2S0_BCLK1/SPIO_CS1_ MISO/SPI1_MISO/UART0_RX/SPI1_MOSI/ UART0_TX/ SIC_SDAT0/DISPL_X_11 /KEYADC7	VCC-IO
38	PB2	I/O	PB2/SDCO_CMD/I2C0_SDA/I2CS_SDA/SPI O_CS1/SPI1_CS/UART0_TX/CPUPLL_INFO UT/CPUPLL_REFOUT/PWM2/SIC_SCLK/DIS PL_X_12	VCC-IO
39	PB1	I/O	PB1/SDCO_CLK/FM_CLK/PLL_TEST/SPIO_C LK/SPI1_CLK/UART0_RX/SWCLK_0/SWCLK _1/UART1_TX/SIC_SDAT0/DISPL_X_13	VCC-IO
40	PB0	I/O	PB0/SDCO_D0/I2C0_SCK/I2CS_SCK/SPIO_C S1_MOSI/SPI1_MOSI/UART1_RX/SWDIO_ 0/SWDIO_1/SIC_SCLK/DISPL_X_14	VCC-IO
41	PD10	I/O	PD10/DMIC_DATA0/I2C0_SDA/DKC1/PW M5/I2S0_LRCK/UART2_RX/SPI1_MOSI/I2C S_SDA/UART0_TX/I2C1_SDA/DISPL_X_15	VCC-IO
42	PD9	I/O	PD9/DMIC_CLK/I2S0_MCLK/IR_Rx/SPIO_C S1/SPI1_CS/PWM4/UART0_TX/SDCO_D3/ DISPL_X_14/UART0_RX/KEYADC6	VCC-IO
43	PD8	I/O	PD8/DMIC_DATA1/I2CS_SDA/DKC2/I2S0_ BCLK/I2C1_SCK/UART2_TX/SPI1_CLK/PW M3/UART0_RX/SDCO_D2/DISPL_X_13	VCC-IO
44	PD7	I/O	PD7/SPI1_CS/I2S0_LRCK/UART1_RX/UART 1_TX/I2C1_SDA/UART2_CTS/DMIC_CLK/I2 CO_SCK/UART0_TX/SDCO_D1/DISPL_X_12	VCC-IO
45	PD6	I/O	PD6/SPI1_MISO/I2S0_MCLK/UART1_TX/I2 S0_LRCK/I2C0_SDA/UART2_RTS/DMIC_DA TA0/I2CS_SDA/PWM3/SDCO_CMD/DISPL_ X_11/UART0_RX/KEYADC5	VCC-IO
46	PD5	I/O	PD5/SPI1_CLK/I2S0_BCLK/UART1_RX/I2S0 _BCLK1/I2C1_SDA/PWM2/DMIC_CLK/I2CS _SCK/UART0_TX/SDCO_CLK/DISPL_X_10 /KEYADC4	VCC-IO

PIN#	PIN NAME	TYPE	Description	Power Domain
47	PD4	I/O	PD4/SPI1_MOSI/I2S0_D1/I2S0_LRCK1/I2C1_SCK/I2S0_MCLK/DMIC_DATA1/COREPLL_REFOUT/COREPLL_INFOUT/SDC0_D0/DISPL_X_9/KEYADC3	VCC-IO
48	PD3	I/O	PD3/SPI1_MISO/I2S0_D0/UART1_RX/I2S0_BCLK1/I2C0_SCK/I2C1_SDA/DMIC_CLK/H_CEC/PWM4/SDC0_D1/DISPL_X_8/KEYADC2	VCC-IO
49	PD2	I/O	PD2/SPI1_CS/I2S0_LRCK/UART1_TX/I2S0_LRCK1/I2C0_SDA/DMIC_CLK/DMIC_DATA0 / PWM5/SDC0_D2/DISPL_X_7/I2S0_MCLK_IN	VCC-IO
50	PD1	I/O	PD1/SPI1_CS/I2S0_D0/UART2_TX/I2S0_BCLK/I2C0_SCK/DMIC_DATA1/UART1_RX/PWM1/SDC0_D3/DISPL_X_6/UART0_RX	VCC-IO
51	PD0	I/O	PD0/SWD_SELECT/I2S0_LRCK/UART2_TX/PWM0/PLL_TEST/DMIC_CLK/DKC0/UART2_RX/I2C0_SDA/UART0_TX/KEYADC1	VCC-IO
52	PB30	I/O	PB30/DKC1/DMIC_DATA0/UART0_TX/PWM5/H_CEC/I2C0_SCK/UART2_RX/I2S0_MCLK/UART1_TX/IR_Rx/I2CS_SDA/KEYADC0	VCC-IO

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	-40	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 QFN52L(6mm x 6mm 0.4pitch)

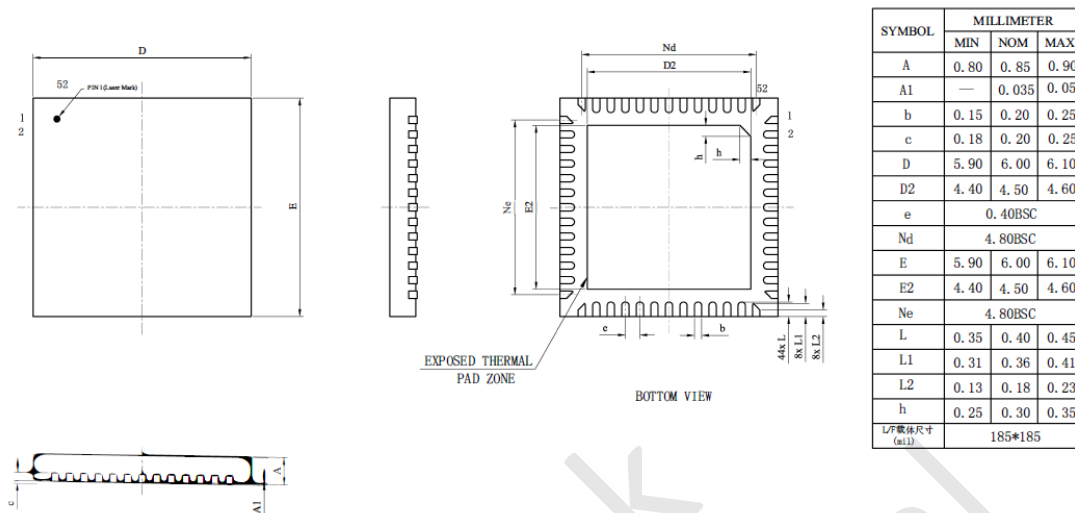


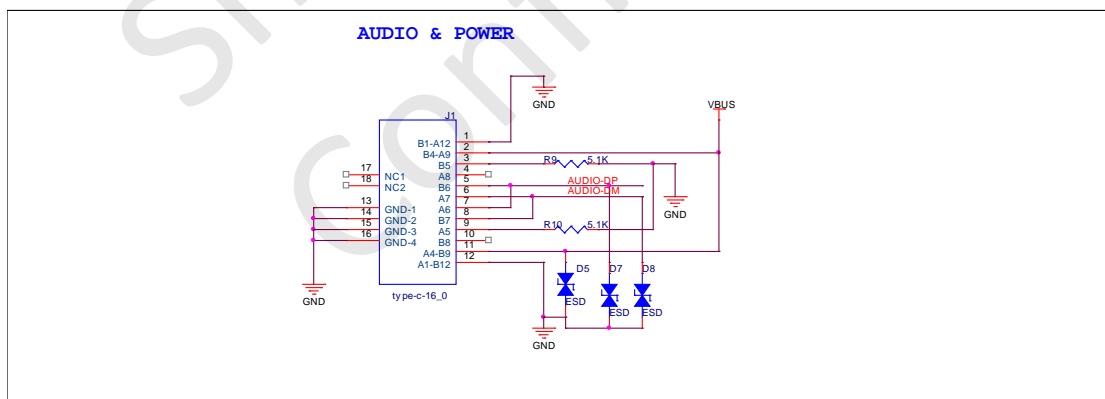
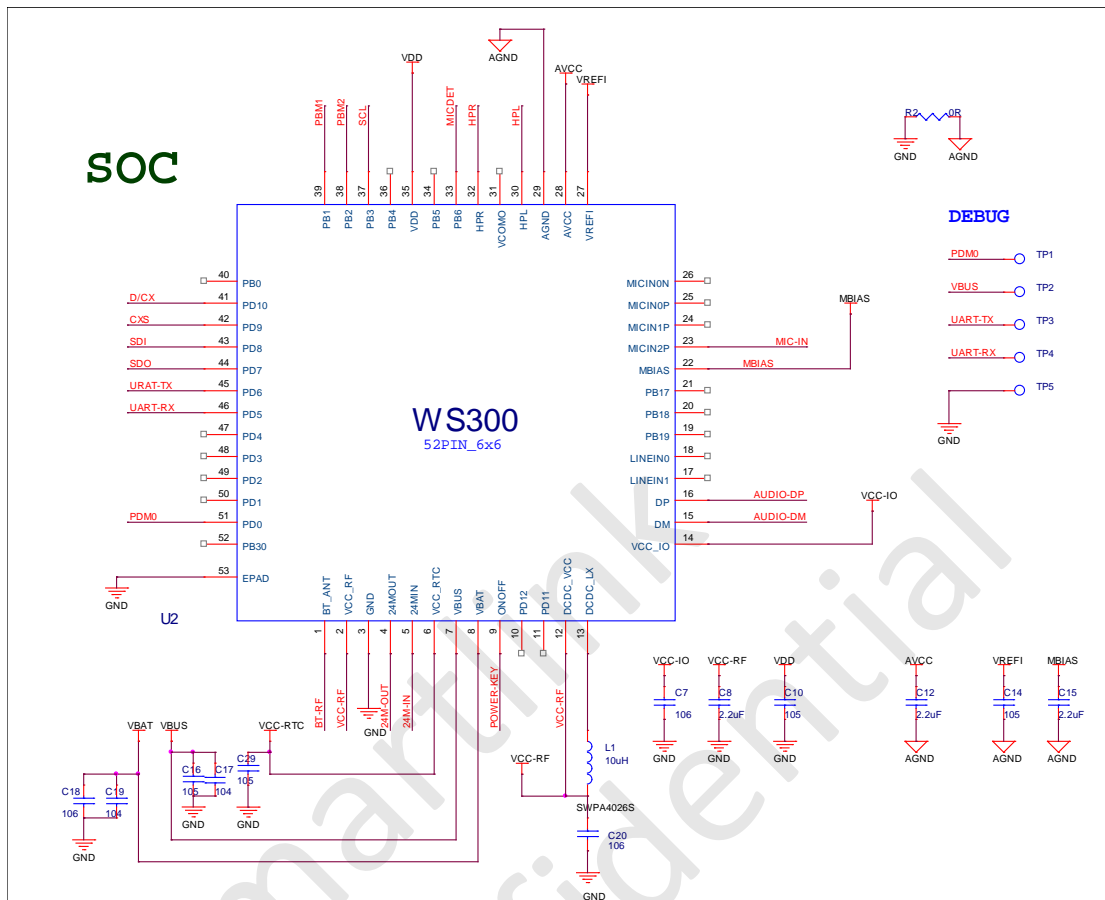
Figure 7-1 WS300 Package

7.2 RoHS compliance

WS300 meets the requirements of Directive 2011/65/EU of the European Parliament and of the Council on the Restriction of Hazardous Substance (RoHS).

8 Example Application Schematic

8.1 AI MIC (Dongle)



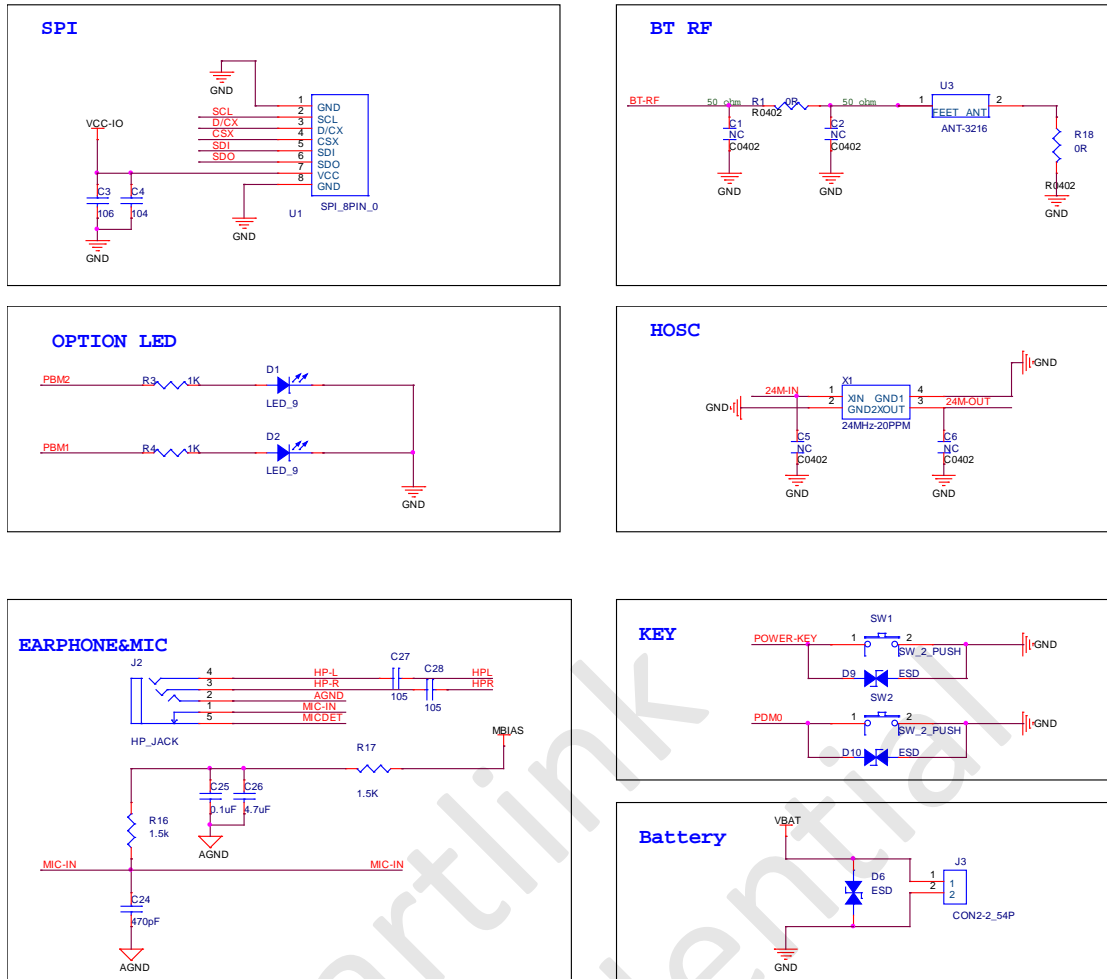
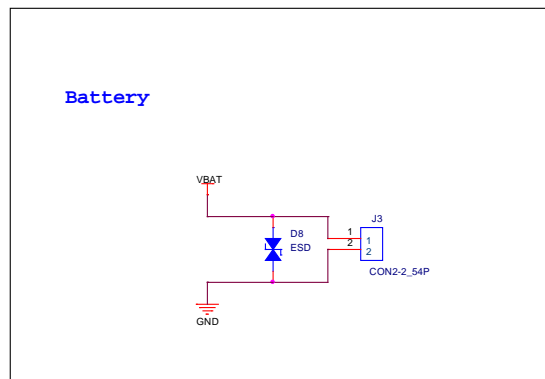
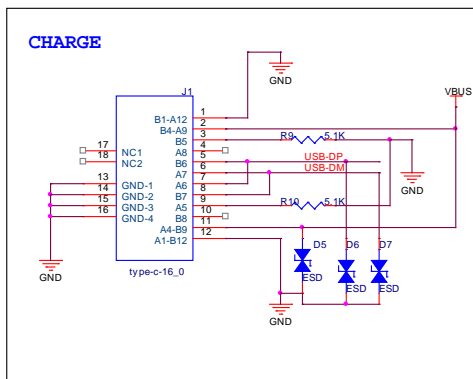
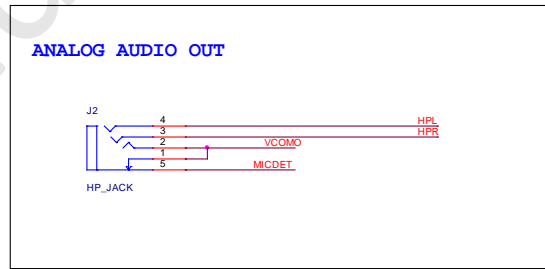
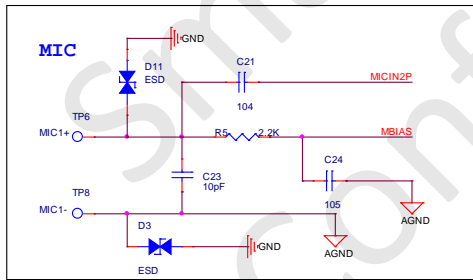
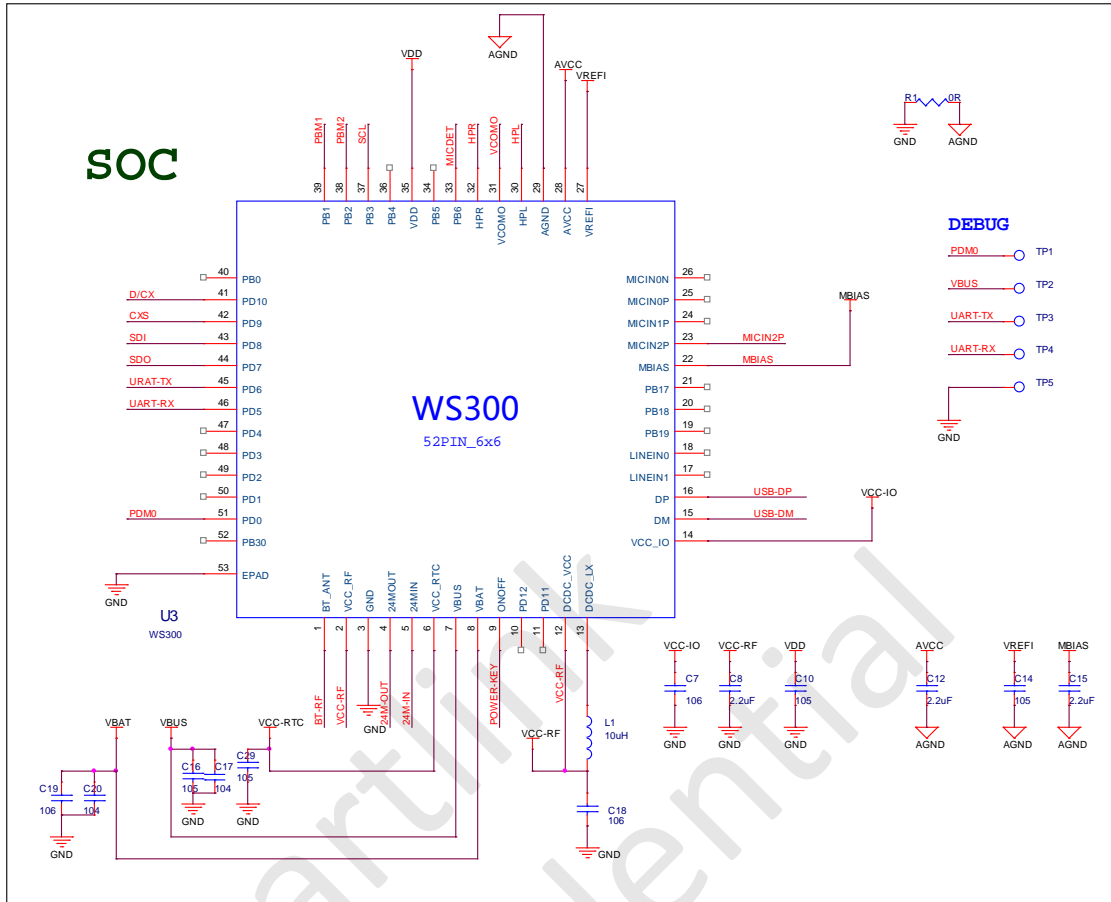


Figure 8-1 AI MIC (Dongle) application schematic

8.2 AI MIC



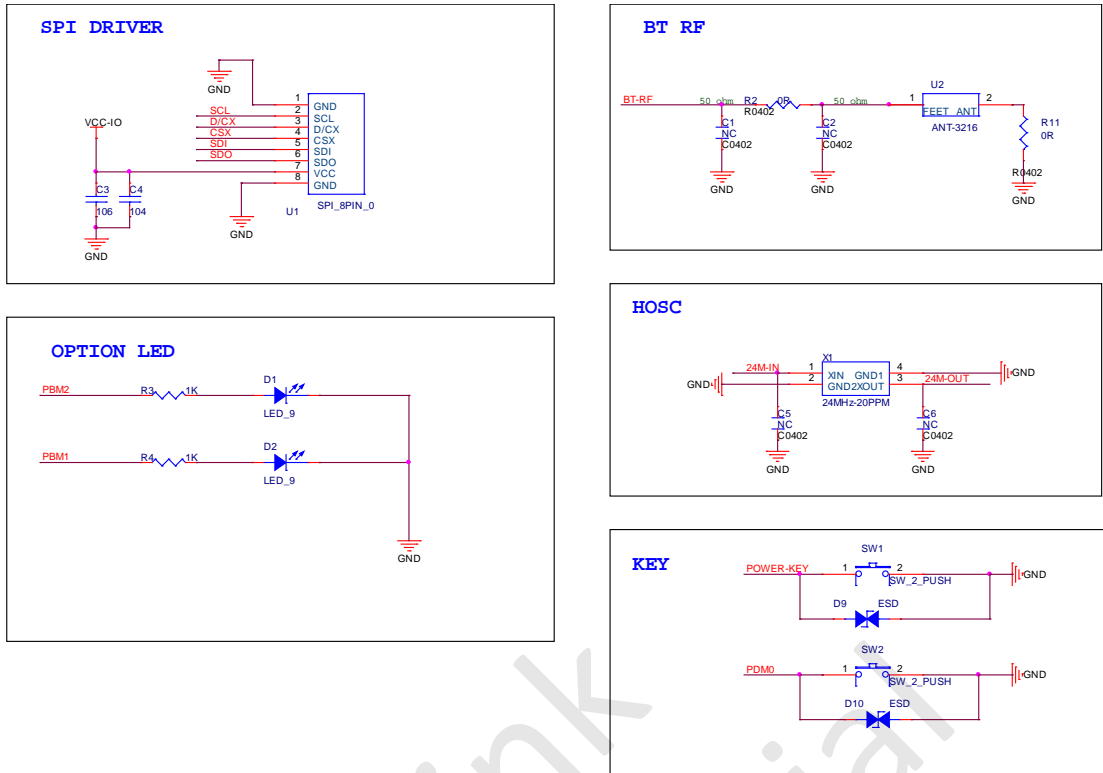


Figure 8-2 AI MIC example application schematic

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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