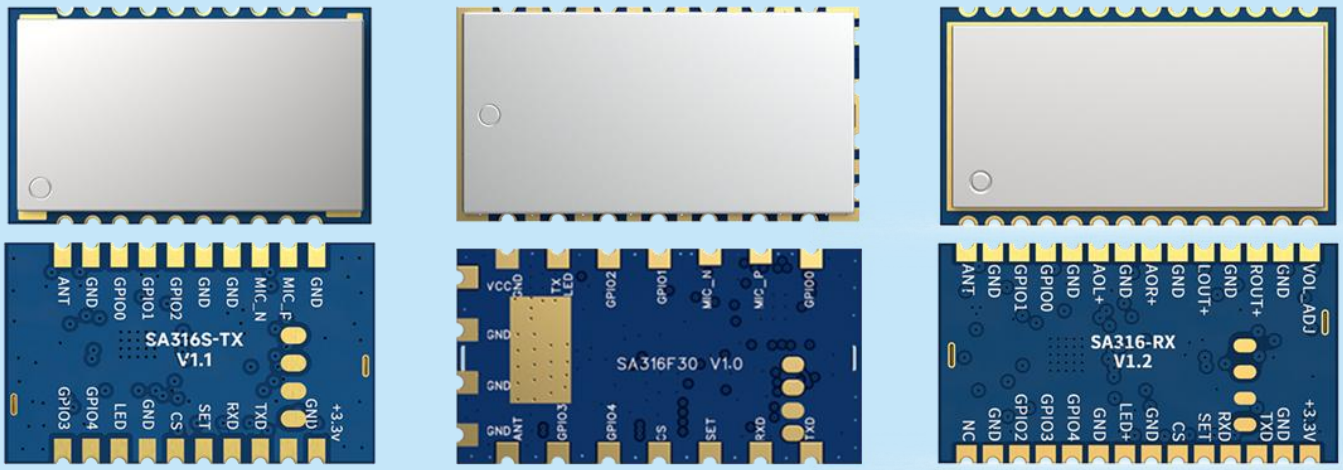
- Small size, stamp-hole design for embedding
- Wireless high-fidelity audio, up to 48kHz sampling
- Low latency, <3ms from mic input to output
- 32-bit encrypted data transmission

Product Specification



SA316S-TX SA316F30 SA316-RX

Catalogue

Note: Revision History

Revision	Date	Comment
V1.0	2021-7	First release
V1.1	2022-6	Add product configuration instructions
V1.2	2022-8	Modify pin definition
V1.3	2023-2	Modify application circuit
V1.4	2023-8	Modify pin definition
V1.5	2024-4	Add SA316F30-TX parameters
V1.6	2024-11	Update configuration instructions, add power comp table

1. Overview

The SA316 series products are divided into transmitter modules SA316S-TX, SA316F30, and receiver module SA316-RX. This series uses a wireless high-quality voice transmission chip for its design. It can support external PCM / IIS dual-mode digital audio interfaces, and provides customers with a standardized serial interface. Users can quickly and easily set the module's transceiver frequency, volume, microphone gain, and other parameters through serial port commands, which is widely used in situations that require high sound quality.

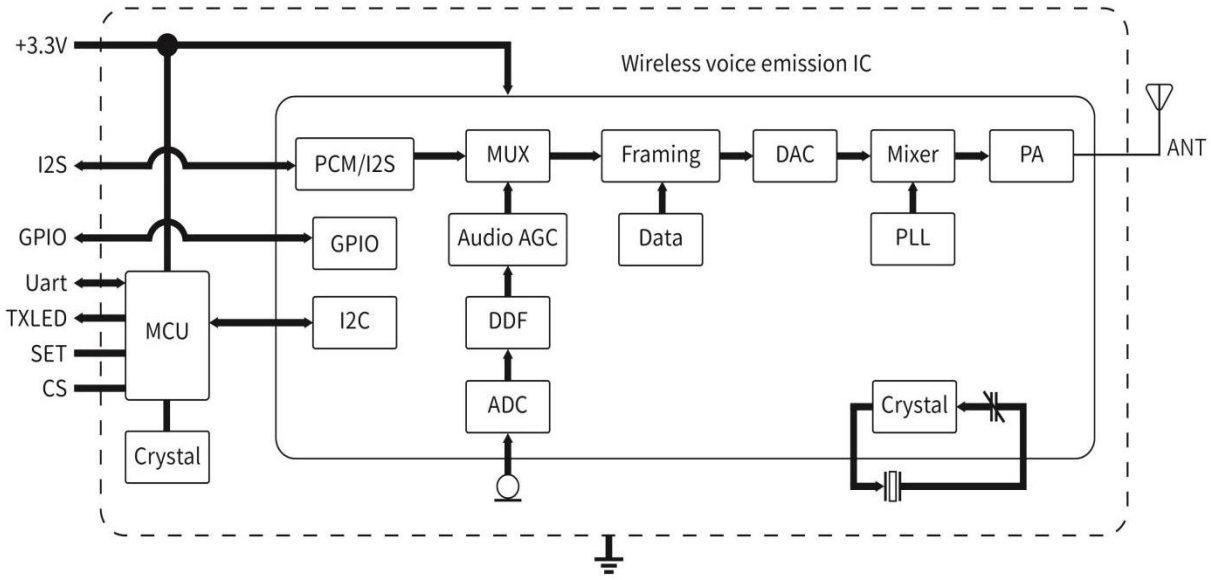
2. Features

- UHF frequency band：500MHz/868/915M
  UHF frequency band：450~980 MHz
  VHF frequency band：160~270 MHz
- SA316F30-TX Open Area Transmission Distance:1500 meters
- SA316S-TX Open Area Transmission Distance: 200 meters
- Receiving sensitivity: 96 dBm
- Audio signal to noise ratio: 86 dB
- Frequency response: 30 Hz-20 KHz
- The delay from microphone input to audio output is less than 3ms
- Digital modulation method: pi/4 DQPSK
- Occupied bandwidth: <300 KHz
- Transmission rate 204.8 Ksps
- Sampling rate: 48 KHz

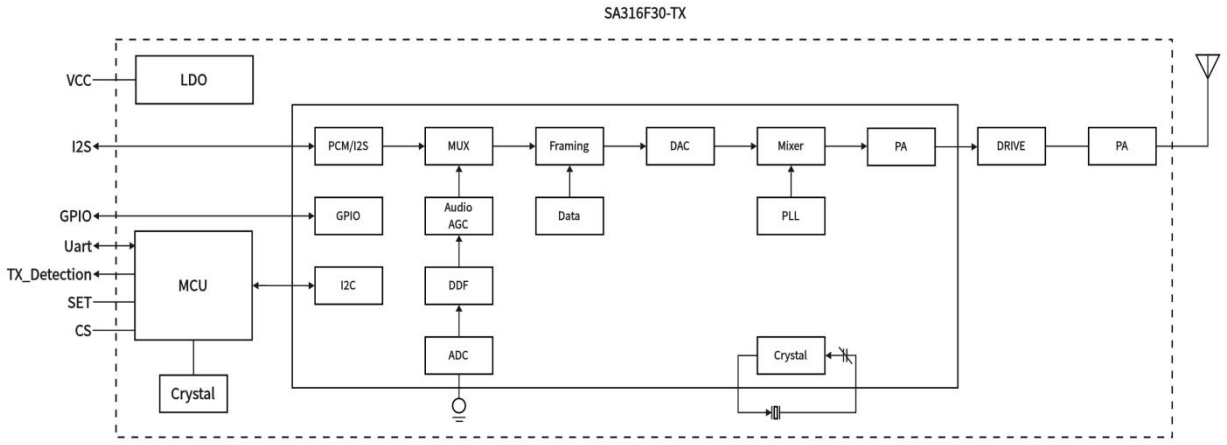
3. Applications

- Wired speakers to wireless speakers
- wireless microphone
- Wireless Headphones
- High-quality wireless audio transmission

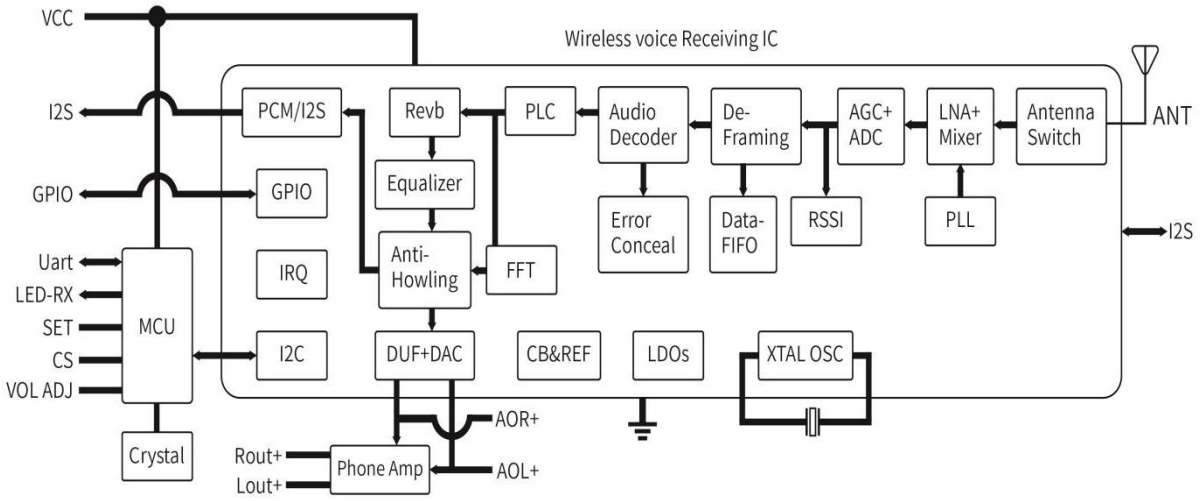
4. Typical application circuit



SA316S-TX block diagram



SA316F30-TX block diagram



SA316-RX block diagram

5. Electrical Characteristics

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Operating voltage range	@SA316S-TX, SA316-RX	2.8	3.3	3.6	V
	@SA316F30	3.3	4.0	5.0	
Range of working temperature		-20	25	60	℃
Operating frequency range	@UHF	500		540	MHz
		800		890	MHz
		890		980	MHz
	@VHF	160		270	MHz
Audio transmission and reception delay			4		ms
Serial port baud rate			9600		bps

Current consumption					
Sleep current(SA316-RX)			<0.4		mA
Sleep current (SA316S-TX,SA316F30)			5	10	uA
Receive current （SA316-RX)	@VCC=3.3V		< 115		mA
Transmit Current （SA316S-TX）	@ During Transmission		< 100		mA
	@Not Transmitting		<54		mA
Transmit Current （SA316F30-TX）	@During Transmission,5v		< 700		mA
	@Not Transmitting,5v		<60		mA
Transmit parameter					
Transmit power	@SA316S-TX, VCC=3.3V	9	10	11	dBm
	@SA316F30-TX, VCC=5.0V	29	30	31	dBm
Emission bandwidth （BW)			300		KHz
Adjacent channel power ratio（ACPR）	@600KHZ		-60		dBc
Maximum microphone input voltage			0.1	1.0	Vrms
Audio frequency response range		30		20k	Hz
Receive parameters					
Receiving sensitivity			-96		dBm
Audio output amplitude (differential)			400		mVrms
Audio output drive resistance			600		Ohm
Signal to Noise Ratio (SNR)	@1KHz		86		dB
Total harmonic distortion (THD)	@48KSampling Rate		0.07		%

Due to the high heat generationit is recommended that the transmission time should not exceed 5 minutes when the SA316F30-TX module is transmitting frequently. If continuous transmission is necessary, the module will disconnect for 500ms after transmitting 5 minutes, and then it can continue to transmit uninterrupted thereafter.

6. Power Level Correspondence Table (SA316F30)

Power Levels	500MHz		860MHz	
	Power（dBm)	Current（mA)	Power（dBm)	Current（mA)
0	22.7	418	24.1	380
2	24.6	437	25.8	418
4	27.0	486	27.7	505
6	28.1	521	28.5	562
8	30.0	601	29.2	649
10	30.1	627	29.8	675

7.Voltage and Power Correspondence Chart (SA316F30)

Supply voltage(V)	500MHz		860MHz	
	Power（dBm)	Current（mA)	Power（dBm)	Current（mA)
5.0	30.1	626	29.6	640
4.5	28.5	583	28.7	612
4.0	27.4	546	28.0	581
3.5	26.5	488	26.9	519
3.0	24.0	345	22.0	315

8.Product configuration description

1）Version：Firmware Version of module 1.2

2）Channel：1-16channel can be chose

External power supply is required for configuring channels of SA316.

Each frequency band is divided into 16 channels, with a difference of 1MHz between adjacent channels. The specific corresponding frequencies are shown in the table below：

frequency band	channel	1	2	3	4	5	6	7	8
500-515	frequency	500	501	502	503	504	505	506	507
	channel	9	10	11	12	13	14	15	16
	frequency	508	509	510	511	512	513	514	515
frequency band	channel	1	2	3	4	5	6	7	8
852-867	frequency	852	853	854	855	856	857	858	859
	channel	9	10	11	12	13	14	15	16
	frequency	860	861	862	863	864	865	866	867

3）Output Power: 0-10dBm ; default: 10dBm

4）Input Source: MIC or IIS; default: MIC

5）Format: when use IIS , you can choose High Bits or Low Bits

6）Net ID: you can set ID of each module

7）Volume: high low of voice, default: 18%（（If the receiver volume is set to 100%, the transmitter volume should be no more than 20% for optimal performance. If the transmitter volume is set too high, the receiver's output volume may become distorted due to saturation.）

8）Signal Strength Threshold: Sound volume preset value. When the emitted sound is larger than this value, it can be emitted. the smaller the more sensitive（If the threshold is set below 55%, it will continuously transmit upon power-on. If it is set between 56% and 80%, it will transmit continuously when the input signal exceeds 50mV Vpp. If it is set above 80%, the input signal must exceed 180mV Vpp for continuous transmission.）

1）Version: Firmware Version of module 1.4

2）Channel: 1-16channel can be chose

External power supply is required for configuring channels of SA316.

Each frequency band is divided into 16 channels, with a difference of 1MHz between adjacent channels.

The specific corresponding frequencies are shown in the table below：

frequency band	channel	1	2	3	4	5	6	7	8
500 - 515	frequency	500	501	502	503	504	505	506	507
	channel	9	10	11	12	13	14	15	16
	frequency	508	509	510	511	512	513	514	515
frequency band	channel	1	2	3	4	5	6	7	8
852 - 867	frequency	852	853	854	855	856	857	858	859
	channel	9	10	11	12	13	14	15	16
	frequency	860	861	862	863	864	865	866	867

3）Anti-Howl: There will be noise when the microphone and speaker are close together.Default OFF.。

4）Input Source: MIC or IIS;　default：MIC

5）Format: when use IIS , you can choose High Bits or Low Bits

6）Net_ID: you can set ID of each module

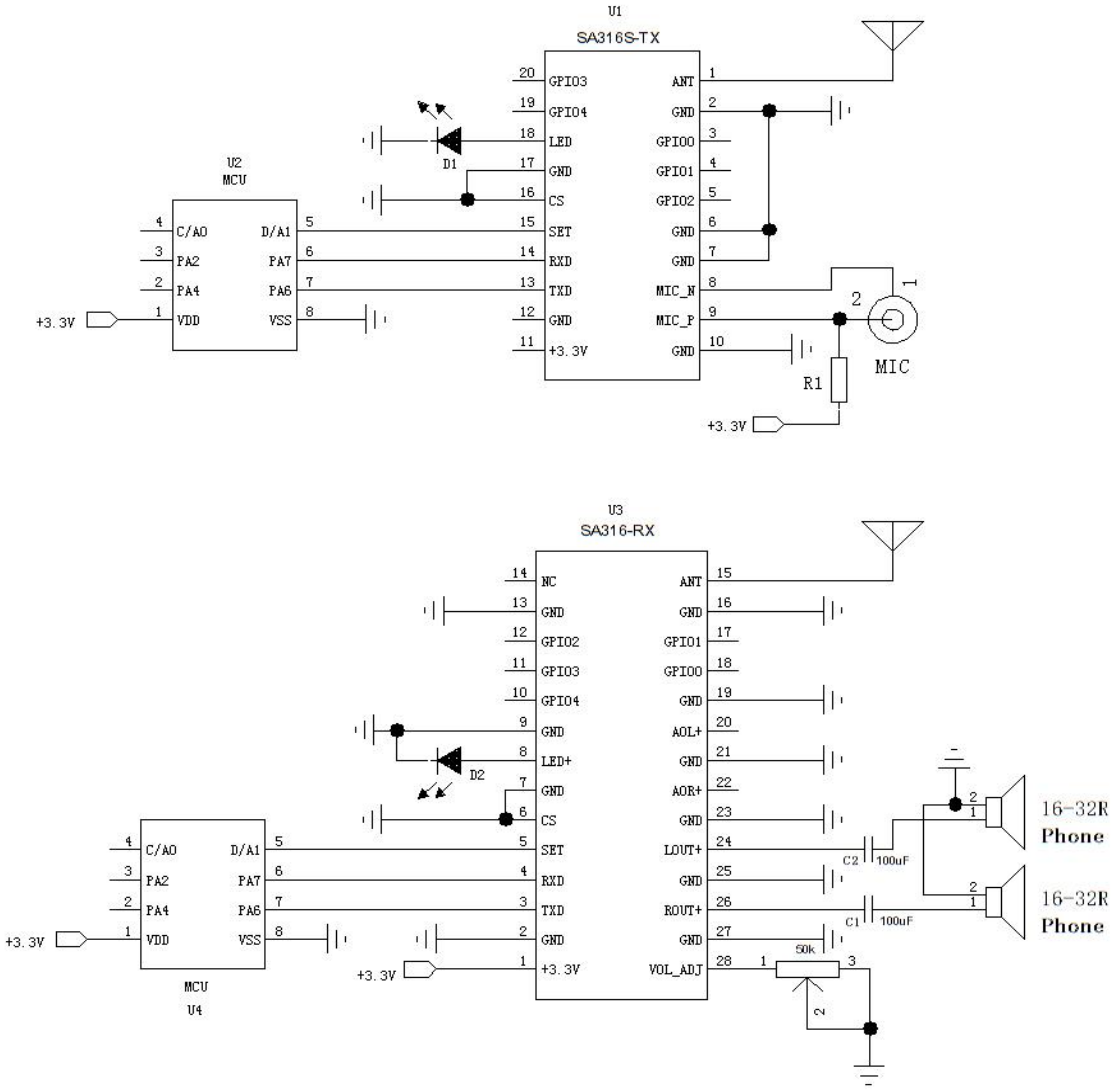
7）Power_Saving: power saving mode, default：off

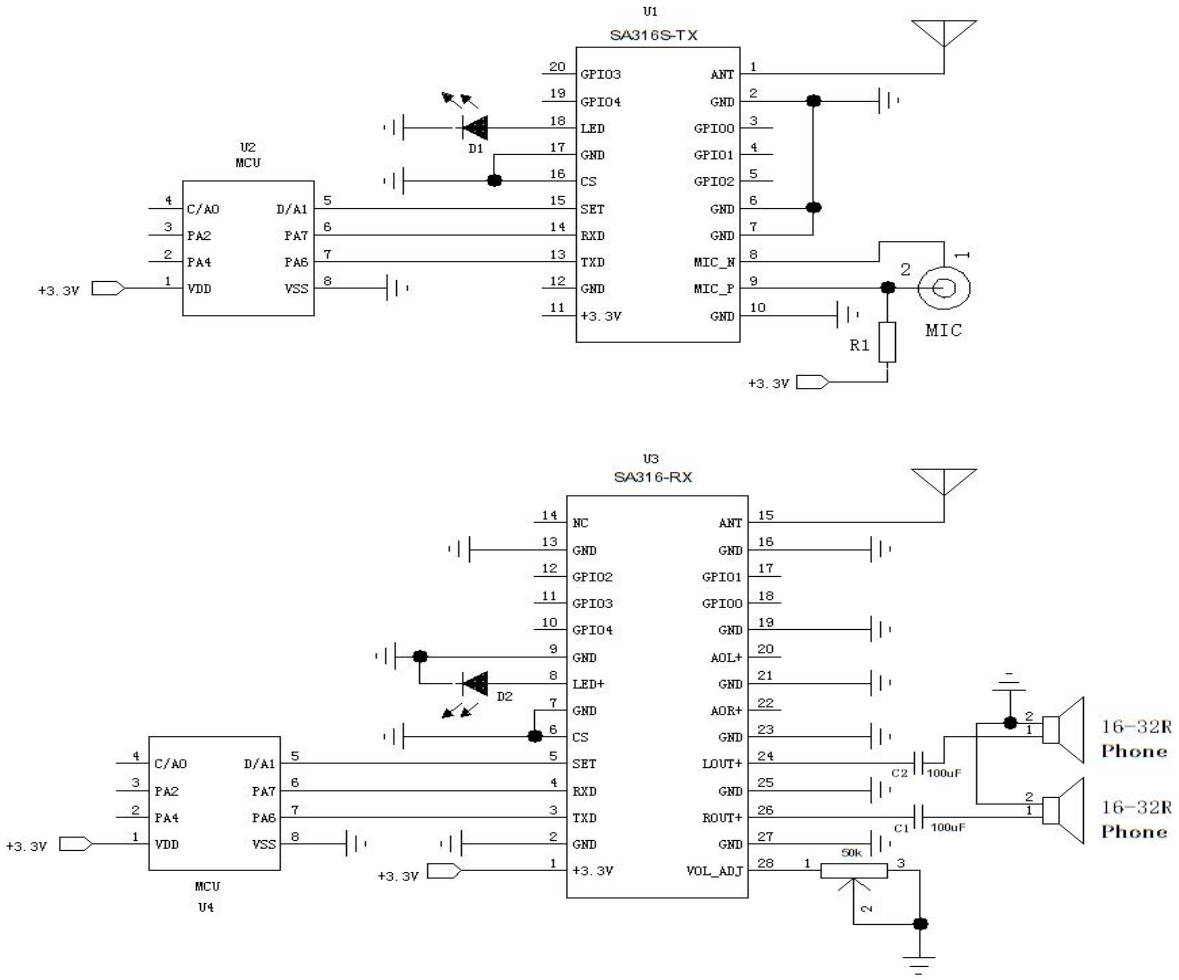
8）Volume: high low of voice,　　default: 77%

9）Signal Strength Threshold: Sound volume preset value. When the emitted sound is larger than this value, it can be played. The smaller the more sensitive.

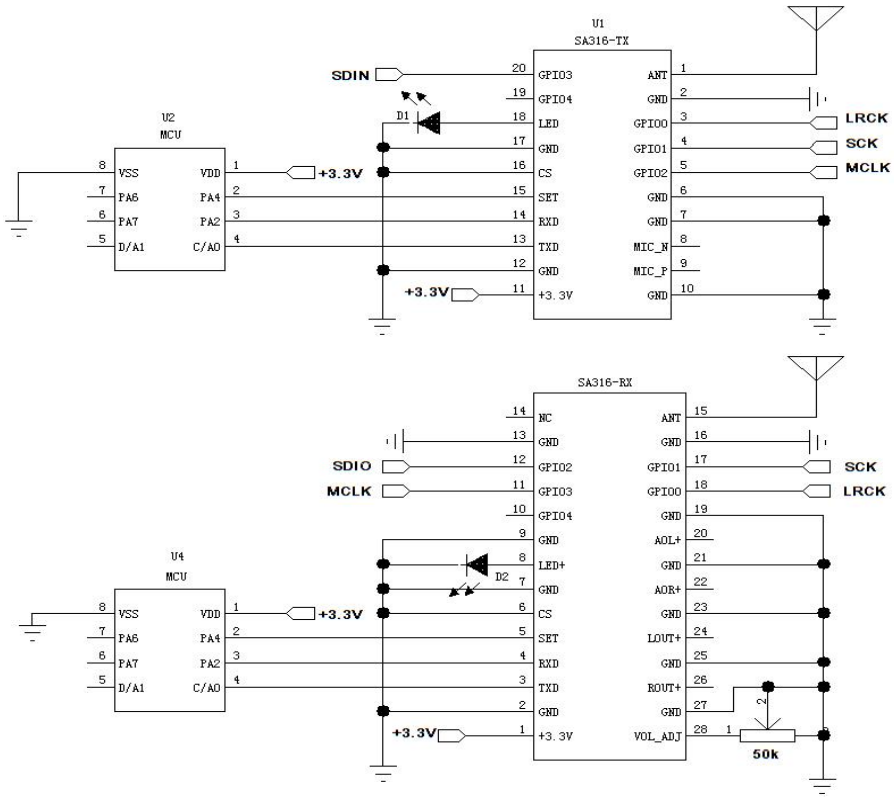
9. Typical application circuit

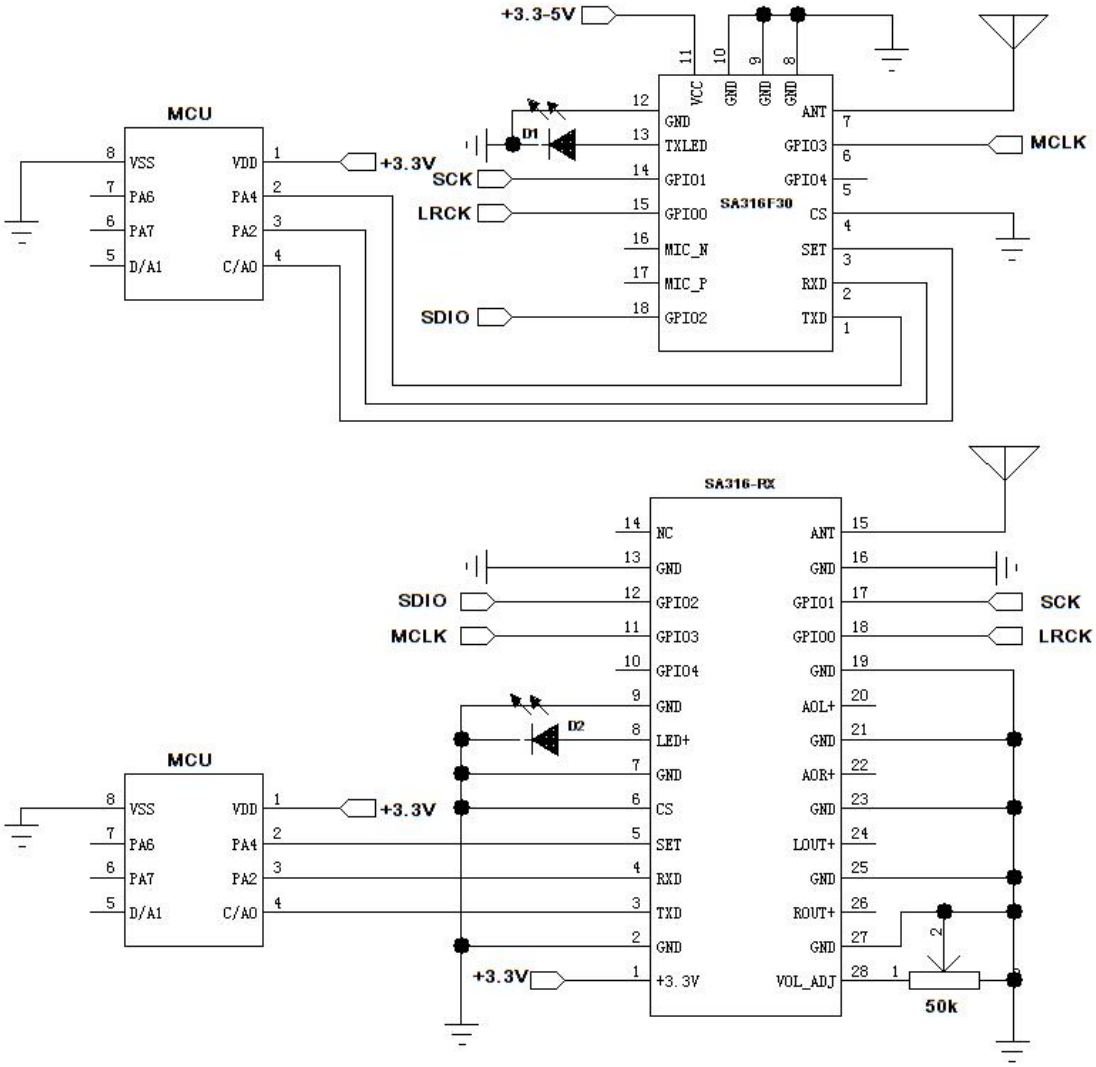
- Analog input and analog output application circuit



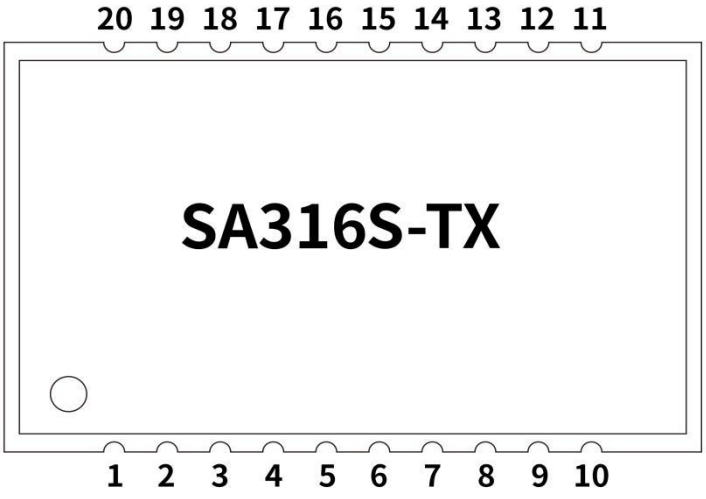


➢ IIS input and output application circuit

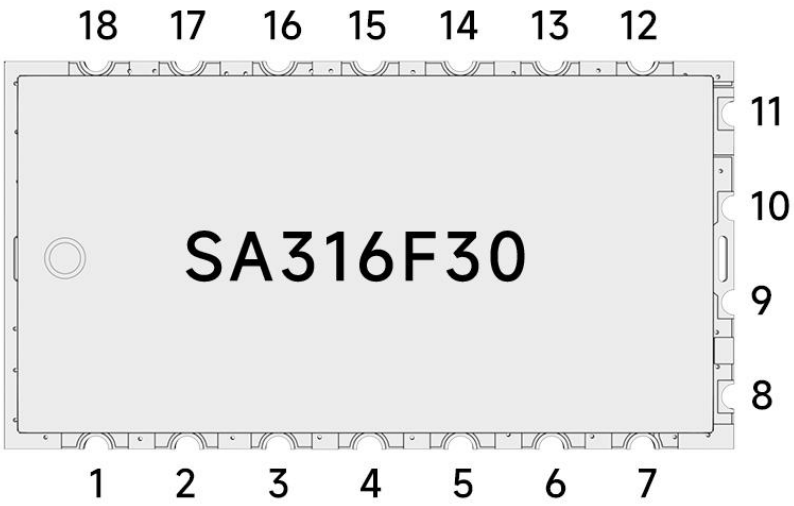




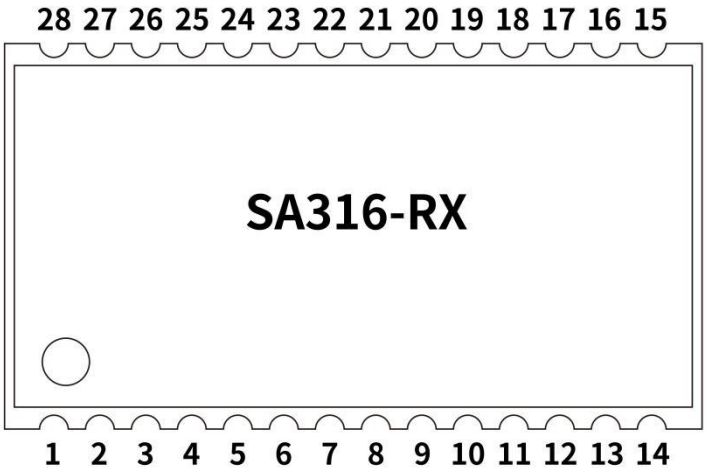
10.Pin definition



Pin NO.	Pin name	I/O	Level standard	Description
1	ANT	0		RF signal output, connect to 50 ohm antenna
2、6、7、10、12、17	GND		0V	Connect to the negative pole of the power supply
3	GPIO0	I/O	0-3.3V	The GPIO0 of the built-in audio chip can be configured as LRCK when using I2S mode
4	GPIO1	I/O	0-3.3V	The GPIO1 of the built-in audio chip can be configured as SCK when using I2S mode
5	GPIO2	I/O	0-3.3V	The GPIO2 of the built-in audio chip can be configured as MCLK when using I2S mode
8	MIC_N	I		Negative end of microphone input, connect to GND
9	MIC_P	I		Positive end of microphone input, (the best signal is less than 300mVrms)
11	VCC		+3.3V	Power positive input (2.8V-3.6V, typical 3.3V)
13	TXD	O	0-3.3V	Serial data output
14	RXD	I	0-3.3V	Serial data input
15	SET	I	0-3.3V	Function temporarily reserved
16	CS	I	0-3.3V	Module sleep pin (low level work, high level sleep)
18	LED	O	0-3.3V	Output indication, high output when transmitting signal, low output when not transmitting signal
19	GPIO4	I/0	0-3.3V	GPIO4 of the built-in audio chip
20	GPIO3	I/O	0-3.3V	The GPIO3 of the built-in audio chip can be configured as SDIN when using I2S mode



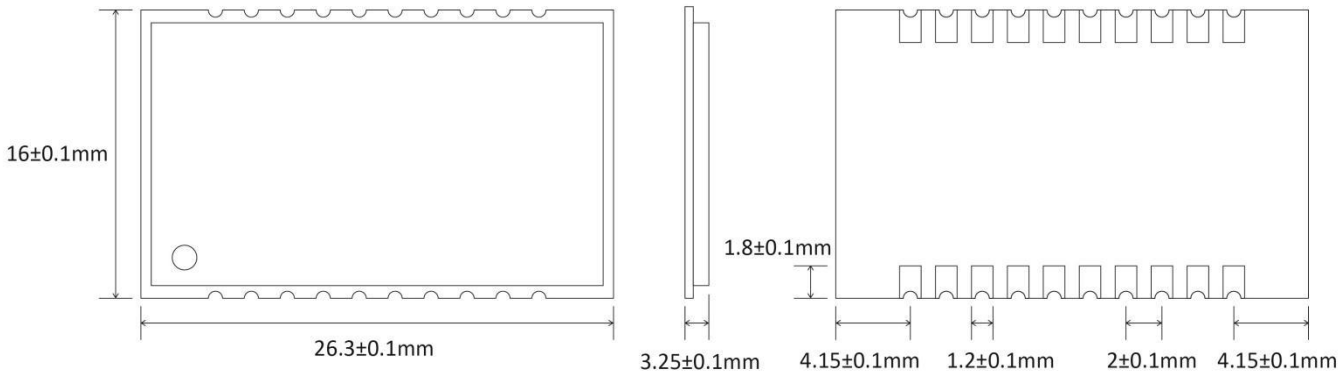
Pin NO.	Pin name	I/O	Level standard	Description
1	TXD	O	0-3.3V	Serial Data Output
2	RXD	I	0-3.3V	Serial data input
3	SET	I	0-3.3V	Function temporarily reserved
4	CS	I	0-3.3V	Module sleep pin (low level work, high level sleep)
5	GPIO4	I/O	0-3.3V	GPIO4 of the built-in audio chip
6	GPIO3	I/O	0-3.3V	The GPIO3 of the built-in audio chip can be configured as SDIN when using I2S mode
7	ANT	O		RF signal output, connect to 50 ohm antenna
8.9,10,12	GND		0V	Connect to the negative pole of the power supply
11	VCC		+3.3-5.0V	Power positive input (+3.3V-5.0V, typical 4.2V)
13	TXLED	O	0-3.3V	Output indication: High when transmitting, low when not.
14	GPIO2	I/O	0-3.3V	Connect audio chip's GPIO2 to I2S mode as MCLK.
15	GPIO1	I/O	0-3.3V	Connect GPIO1 of audio chip to I2S mode as SCK.
16	MIC_N	I		Negative end of microphone input, connect to GND
17	MIC_P	I		Positive end of microphone input, (the best signal is less than 200mVrms)
18	GPIO0	I/O	0-3.3V	The GPIO0 of the built-in audio chip can be configured as LRCK when using I2S mode



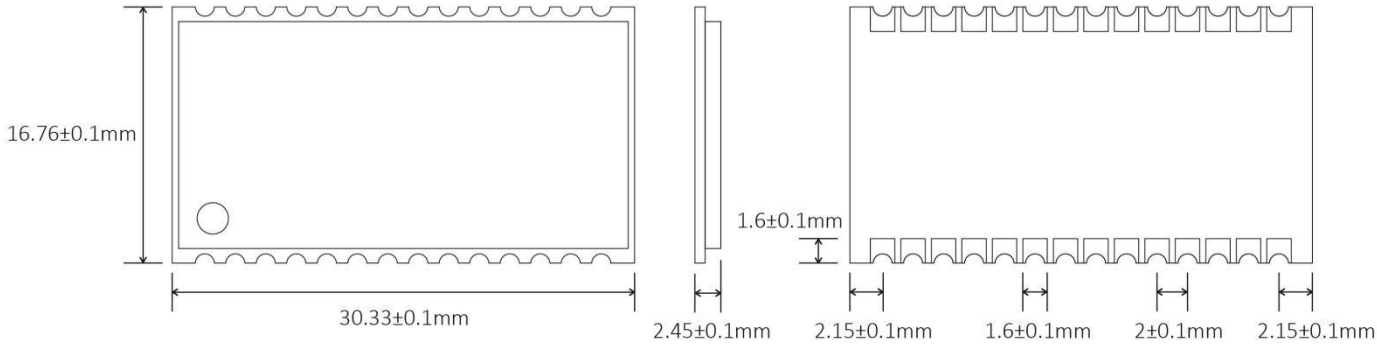
Pin NO.	Pin name	I/O	Level standard	Description
1	VCC		+3.3V	Power positive input (2.8V-3.6V, typical 3.3V)
2，7，9,13,16, 19,21,23,25,27	GND		0V	Connect to the negative pole of the power supply
3	TXD	O	0-3.3V	Serial data output
4	RXD	I	0-3.3V	Serial data input
5	SET	I	0-3.3V	Function temporarily reserved
6	CS	I	0-3.3V	Module sleep pin (low level work, high level sleep)
8	LED	O	0-3.3V	Output indication, output high after receiving signal, low when no signal
10	GPIO4	I/0	0-3.3V	GPIO4 of the built-in audio chip
11	GPIO3	I/O	0-3.3V	The GPIO3 of the built-in audio chip can be configured as MCLK when using I2S mode
12	GPIO2	I/O	0-3.3V	The GPIO2 of the built-in audio chip can be configured as SDIO when using I2S mode
15	ANT	I		RF signal input, connect to 50 ohm antenna
17	GPIO1	I/O	0-3.3V	The GPIO1 of the built-in audio chip can be configured as SCK when using I2S mode
18	GPIO0	I/O	0-3.3V	The GPIO0 of the built-in audio chip can be configured as LRCK when using I2S mode
20	AOL+	O		Chip audio output negative terminal (up to 600mVrms)
22	AOR+	0		Chip audio output positive terminal (up to 600mVrms)
24	LOUT+	O		The amplified audio output is the left channel output, which can directly drive headphones after connecting 100UF capacitors in series
26	ROUT+	O		The amplified audio output is the right channel output, which can directly drive the headphones after connecting a 100UF capacitor in series
28	VOL_ADJ	I		Volume adjustment pin, external 50K ohm adjustable potentiometer

11.Mechanical size (unit：mm)

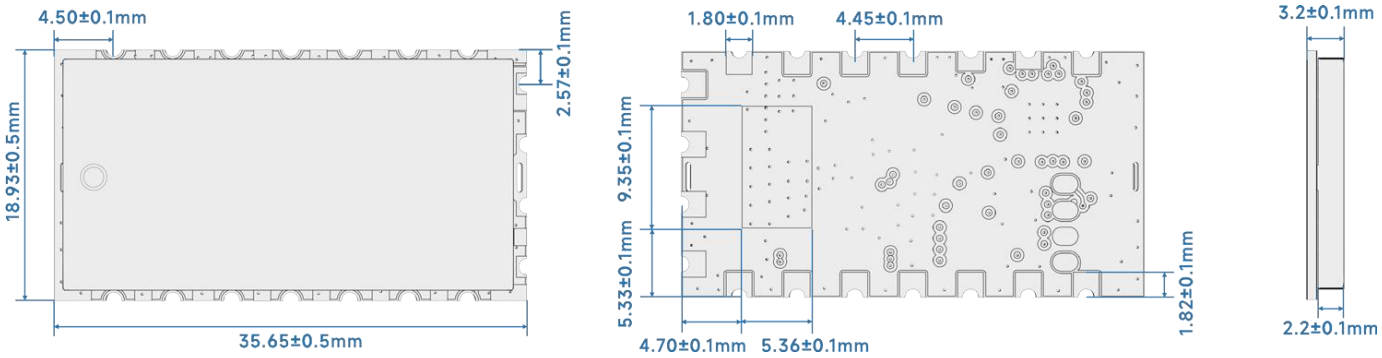
- SA316S-TX



- SA316-RX

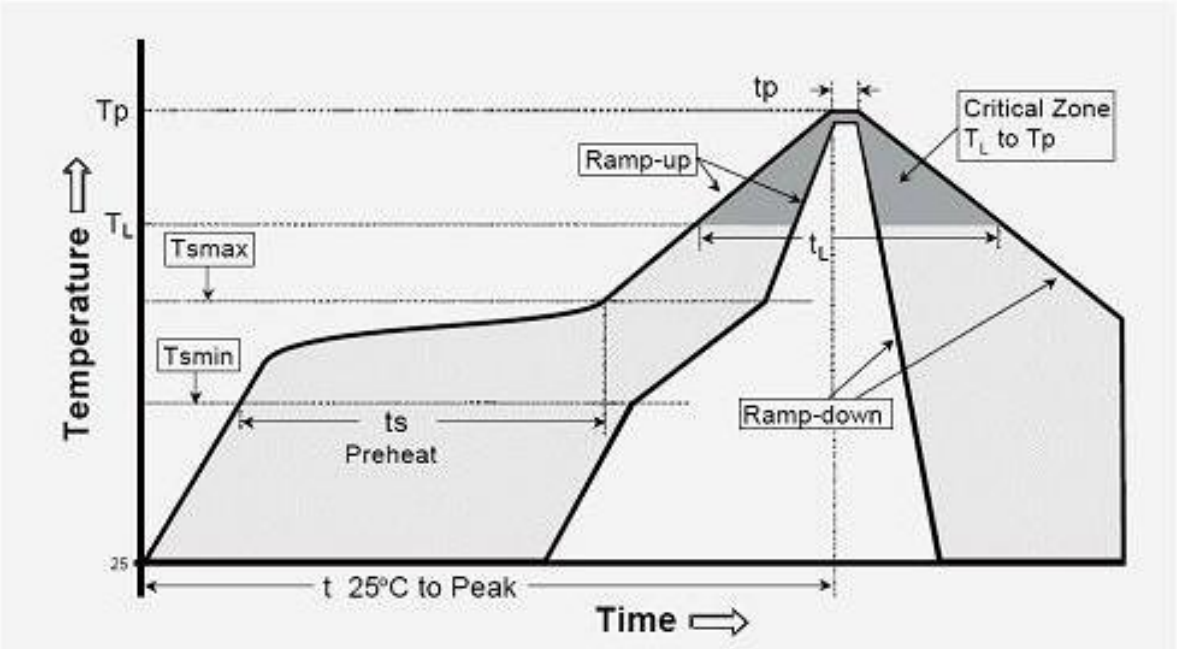


- SA316F30-TX



Appendix: Furnace temperature curve diagram

We recommend you should obey the IPC related standards in setting the reflow profile:



IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness >=2.5mm)
The ramp-up rate (Tl to Tp)	3℃/s (max.)
preheat temperature - Temperature minimum (Tsmin) - Temperature maximum (Tsmax) - preheat time (ts)	 150℃ 200℃ 60~180s
Average ramp-up rate(Tsmax to Tp)	3℃/s (Max.)
- Liquidous temperature(TL)	217℃
- Time at liquidous(tL)	60~150 second
peak temperature(Tp)	245+/-5℃