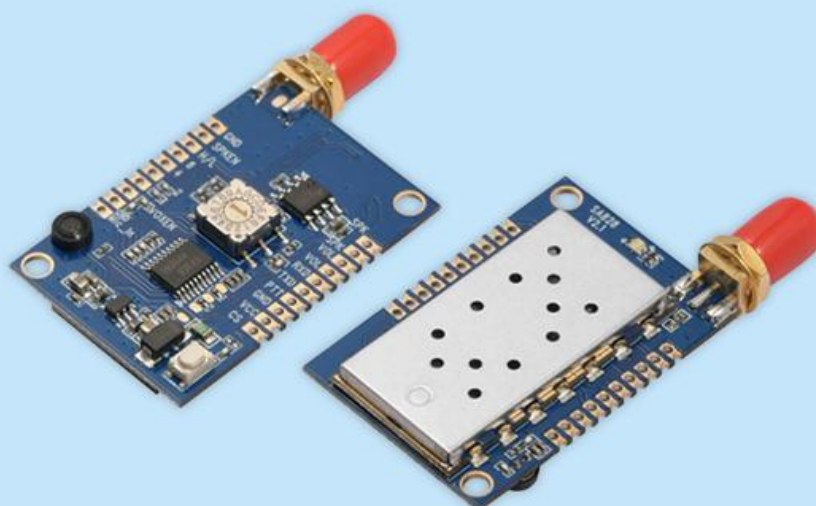


1.5W Full featured miniature walkie talkie module

Product Specification



Catalogue

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Note: Revision History

Revision	Date	Comment
V1.0	2014-03-20	First release
V2.0	2015-05-28	Graphic description added
V2.1	2017-06	Logo updated
V2.2	2019-03	PCB update to V1.3
V2.3	2020-11	Update description
V2.4	2022-11	Update picture
V2.5	2023-8	Update frequency

1. Description

SA828 is a high cost-effective full-featured walkie talkie module with 1.5W output power, it comes with built-in high performance microcontroller, narrow band RF transceiver IC and RF power amplifier, all parameters(CTCSS, CDCSS, SQ, Predefined channels etc.) can be easily modified by PC software, Users only need to add external power supply, speaker, and audio taper, then it becomes a miniature walkie talkie with 16 adjustable channels. Simplified interface and Ultra small size make this module widely used in various applications and conveniently embedded into various handheld.

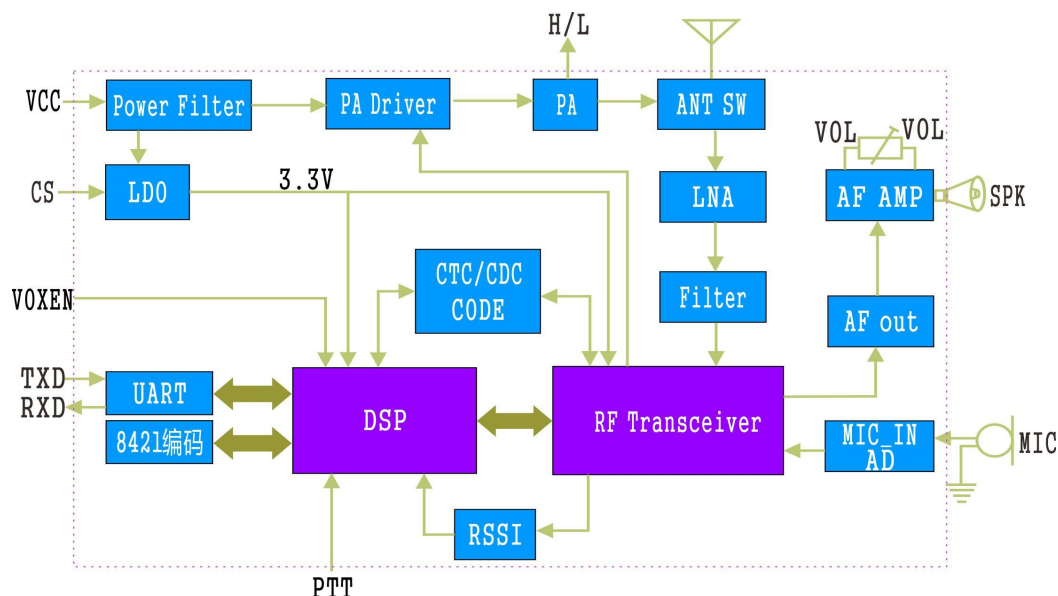
2. Features

- UHF Frequency : 400~470 MHz
- VHF Frequency :134~174 MHz
- 350 band frequency: 320-400MHz
(3 frequency bands are optional)
- Tx and Rx frequency can be set alone
- Bandwidth 12.5 / 25 KHz
- High/ low power is optional
(500mW/1.5W)
- Distance up to 4-5km in open area
- High Sensitivity: -124 dBm
- High-integrated, Small Size
- 38 CTCSS (can be set via PC software and serial port)
- 166 CDCSS
(can be set via PC software and serial port)
- 8 level squelch
- Wide range of working voltage 3.3-5.5 V
- External potentiometer to adjust volume
- 1 ppm KDS TCXO crystal, Stable performance

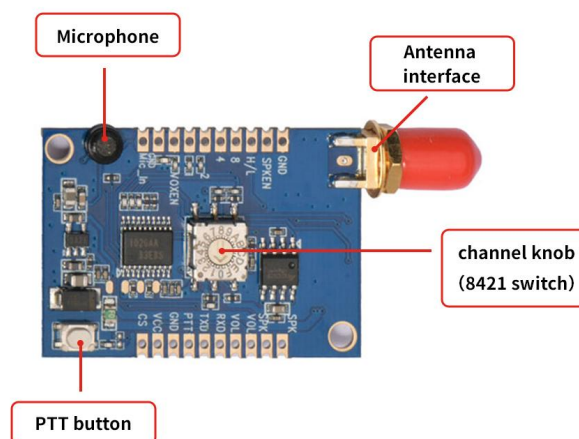
3. Application

- Small walkie talkie
- Invisible intercom system
- audio surveillance system
- Outdoor Sport products
- building community security system

4. Internal block diagram



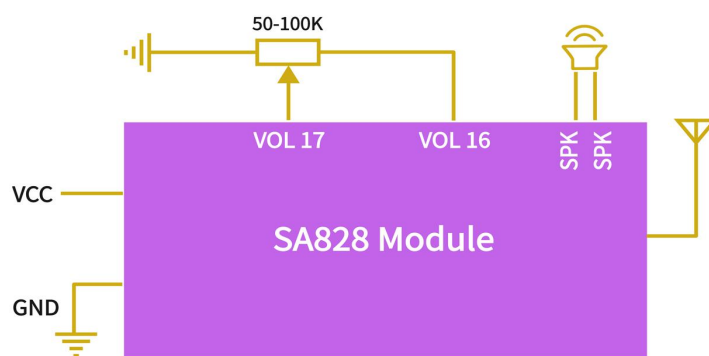
5. Interface description



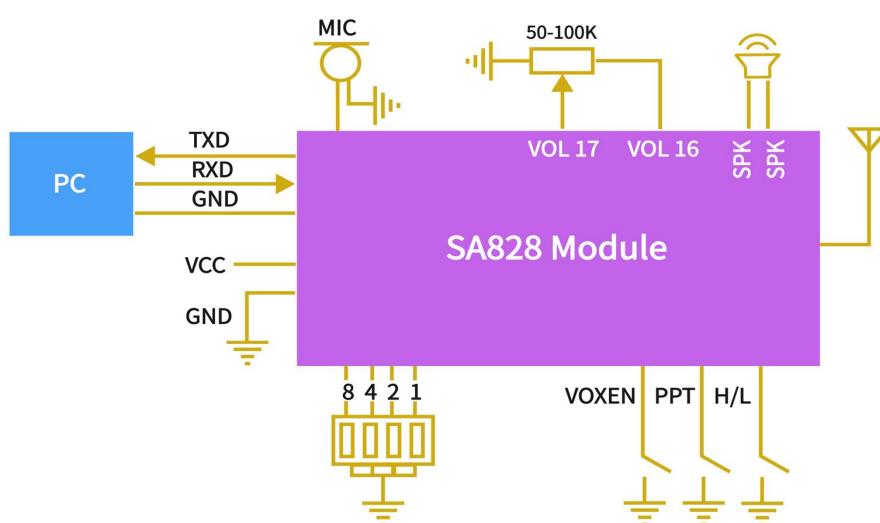
6. Specification

Parameter	Test condition	Min	Typ.	Max	Unit
Power supply		3.3	4.2	5.5	V
Working Temperature range		-30	25	70	°C
Current Consumption					
Sleep current			≤3		uA
RX current			60		mA
TX current (High power)			800	900	mA
TX current (low power)			350	450	mA
Transmitting RF Parameters					
Frequency range	UHF	400	450	470	MHz
	VHF	134	150	174	MHz
	350	320	350	400	MHz
Out power (high power)	@VCC=4.0V	30	31.5	32.5	dBm
Out power (low power)		25	26.5	28	dBm
modulation sensitivity	@1.5KHz/2.5KHz Frequency deviation		10		mV
Audio distortion	@1.5KHz/2.5KHz Frequency deviation		2	5	%
Signal to noise ratio	@1.5KHz/2.5KHz Frequency deviation	38	40	45	dB
Adjacent-channel power	@12.5K offset		-60dBc		dBm
CTCSS modulated frequency deviation		0.35	0.5	0.75	KHz
RX frequency Parameter					
RX sensitivity			-124		dBm
RX SNR	@1.5KHz Frequency deviation	45	50		dB
Audio output power			2		W
Audio output impedance			8		OHm

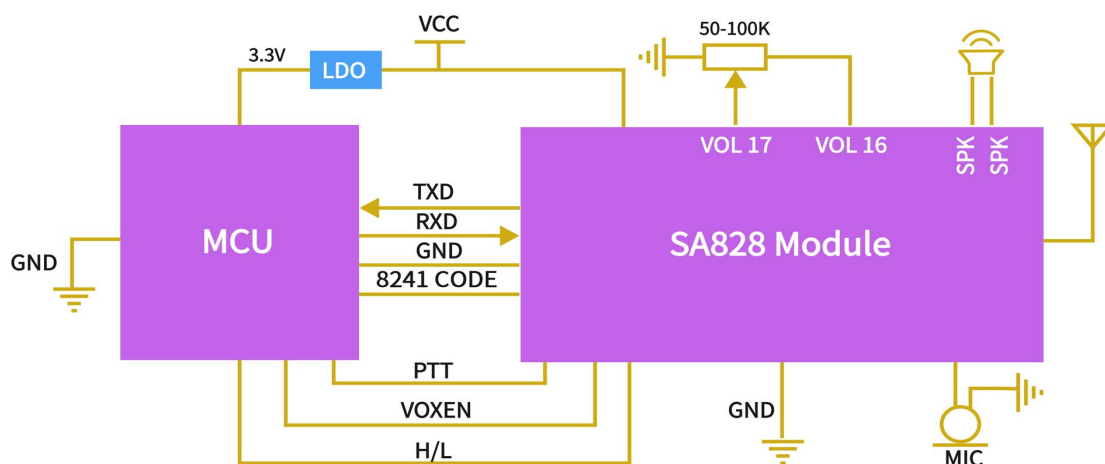
7. Typical application schematic



Standard Schematics



Customized Schematics

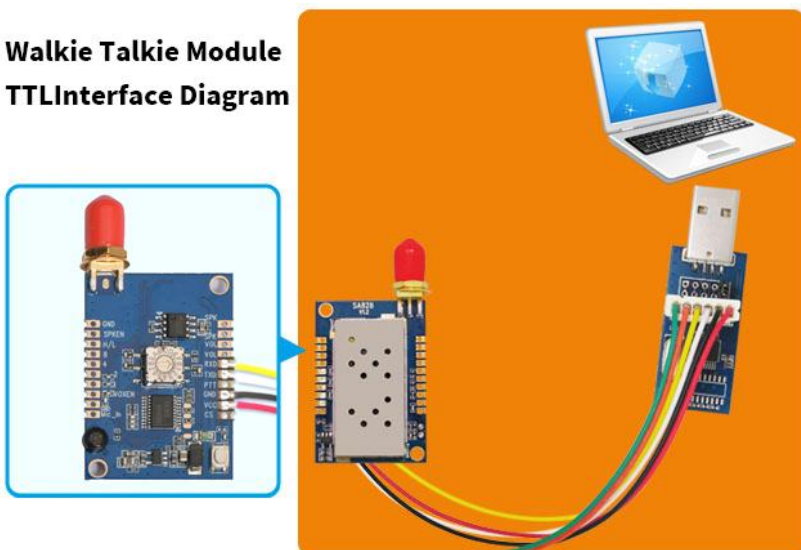


Note: The wiring of VOL pins must be correct

8. Parameter configuration

Module offers standard serial port, user can configure and read the related parameters by sending serial instructions. Module has built-in memory, the related configured parameters can be saved even power off. Meantime, we offer PC software to customers by free charge, users can connect module with PC software via USB bridge board, in this way, user can configure the related parameters on PC software. The connection as shown in the figure below:

**Walkie Talkie Module
TTLInterface Diagram**



- a) Install the USB Driver and PC software in computer.
- b) Connect Module with the related interface USB bridge board through 6 pins terminal wire.
- c) Connect USB bridge board with computer (PC Software).
- d) Module has been into setting Module at this time, show as above.

PC software can read the module's parameter after connecting successfully, As shown below:

NiceRF 深圳市思为无线科技有限公司
思为无线 NiceRF Wireless Technology Co., Ltd
www.nicerf.com
TEL: 0755-61596687

Model: SA828 Version: 1.0

TX Channel				RX Channel			
Channel 1	409.7500 MHz	Channel 9	417.7500 MHz	Channel 1	409.7500 MHz	Channel 9	417.7500 MHz
Channel 2	410.7500 MHz	Channel 10	418.7500 MHz	Channel 2	410.7500 MHz	Channel 10	418.7500 MHz
Channel 3	411.7500 MHz	Channel 11	419.7500 MHz	Channel 3	411.7500 MHz	Channel 11	419.7500 MHz
Channel 4	412.7500 MHz	Channel 12	420.7500 MHz	Channel 4	412.7500 MHz	Channel 12	420.7500 MHz
Channel 5	413.7500 MHz	Channel 13	421.7500 MHz	Channel 5	413.7500 MHz	Channel 13	421.7500 MHz
Channel 6	414.7500 MHz	Channel 14	422.7500 MHz	Channel 6	414.7500 MHz	Channel 14	422.7500 MHz
Channel 7	415.7500 MHz	Channel 15	423.7500 MHz	Channel 7	415.7500 MHz	Channel 15	423.7500 MHz
Channel 8	416.7500 MHz	Channel 16	424.7500 MHz	Channel 8	416.7500 MHz	Channel 16	424.7500 MHz

Device Found!

COM5 CLOSE TX CTCS: 0 TX CDCS: 023I RX CTCS: 0 RX CDCS: 031N S Q: 1

SET READ DEFAULT

- ◆ TX channel: transmitting frequency , total 16 groups, Factory Default as shown in the above interface
- ◆ RX channel: receiving frequency, total 16 groups, Factory Default as shown in the above interface.
- ◆ TX CTCSS: transmitting CTCSS, 38 level for option, Factory Default is 0.
- ◆ TX CDCS: transmitting CDCSS, 166 level for option, Factory Default is 0.
- ◆ RX CTCSS: receiving CTCSS, 38 level for option, Factory Default is 0.
- ◆ RX CDCS: receiving CDCSS, 166 level for option, Factory Default is 0..
- ◆ SQ: receiving Squelch level, 8 level for option, Default is 1.
- ★ Note: For CTCSS and CDCSS ,user can choose one of them to use.

9. Communication protocol

Commands Format:

After module running, the standard setting of serial port as below:

Baud Rate: 9600 bps Data Bit: 8 Stop: 1 Parity: None

Instruction return format:

Return true: OK\r\n, Return false: ERROR\r\n

Frame format Definition :

ASCII is used in communication protocol.

★ Note: CDCSS can be checked in Appendix1

➤ Read Module Name and Version Number

Format: AA FA A

Return Value: SAxxx_VERx.x\r\n

Example: AA FA A (Hex: 0x41 0x41 0x46 0x41 0x41)

Return: SA828-1W_VER1.0\r\n

(Hex: 0x53 0x41 0x36 0x31 0x30 0x5f 0x56 0x45 0x52 0x31 0x2E 0x30 0x0D 0x0A)

➤ Read parameter

Format: AA FA 1

Return: AA FA TFV1, RFV2,, TFV16, RFV16, TX_SUBAUDIO, RX_SUBAUDIO, SQ

Parameters description in the Setup Group Instructions

Example: AA FA 1 (Hex 0x41 0x41 0x46 0x41 0x31)

Return: AA

450.1250,450.1250,451.1250,451.1250,452.1250,452.1250,453.1250,453.1250,454.1250,454.1250,455.1250,455.1250,456.1250,456.1250,457.1250,457.1250,458.1250,458.1250,459.1250,459.1250,450.0250,455.0250,455.1250,455.1250,455.2250,455.2250,455.3250,455.3250,455.4250,455.4250,455.5250,455.5250,011,125,8

(Hex 41 41 34 35 30 2e 31 32 35 30 2c 34 35 30 2e 31 32 35 30 2c 34 35 31 2e 31 32 35 30 2c 34 35 31 2e 31 32 35 30 2c 34 35 32 2e 31 32 35 30 2c 34 35 33 2e 31 32 35 30 2c 34 35 33 2e 31 32 35 30 2c 34 35 34 2e 31 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 36 2e 31 32 35 30 2c 34 35 36 2e 31 32 35 30 2c 34 35 37 2e 31 32 35 30 2c 34 35 37 2e 31 32 35 30 2c 34 35 38 2e 31 32 35 30 2c 34 35 38 2e 31 32 35 30 2c 34 35 39 2e 31 32 35 30 2c 34 35 39 2e 31 32 35 30 2c 34 35 35 2e 30 32 35 30 2c 34 35 35 2e 30 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 35 2e 32 32 35 30 2c 34 35 35 2e 32 32 35 30 2c 34 35 35 2e 33 32 35 30 2c 34 35 35 2e 33 32 35 30 2c 34 35 35 2e 34 32 35 30 2c 34 35 35 2e 34 32 35 30 2c 34 35 35 2e 35 32 35 30 2c 34 35 35 2e 35 32 35 30 2c s30 31 31 2c 31 32 35 2c 38 0d 0a)

➤ **Set to default parameter**

Format: AA FA 2

Return Value: "OK\r\n"OR "ERROR\r\n"

Example: AA FA 2 (Hex 41 41 46 41 32)

Return: OK\r\n (Hex 4f 4b 0d 0a)

➤ **Setup group instructions:**

Description: this command is used to tell module the information of setting parameters

Format: AA FA 3 TFV1, RFV2,, TFV16, RFV16, TX_SUBAUDIO, RX_SUBAUDIO, SQ

Parameter Description: TX_SUBAUDIO: TX CTCSS/CDCSS

RX_SUBAUDIO: RX CTCSS/CDCSS

SQ: Squelch level (0~8) (0: monitor mode,0 can not be used in scan mode)

(Note: TX and RX can use different CTCSS value, 000: no coding 001-038: CTCSS, 039--204: CDCSS, CDCSS displays code on the configuration software, the data and code as shown on Appendix 1)

Example: AA FA 3

450.1250,450.1250,451.1250,451.1250,452.1250,452.1250,453.1250,453.1250,454.1250,454.1250,455.1250,455.1250,456.1250,456.1250,457.1250,457.1250,458.1250,458.1250,459.1250,459.1250,455.0250,455.0250,455.1250,455.1250,455.2250,455.2250,455.3250,455.3250,455.4250,455.4250,455.5250,455.5250,011,125,8

(Hex 41 41 46 41 33 34 35 30 2e 31 32 35 30 2c 34 35 30 2e 31 32 35 30 2c 34 35 31 2e 31 32 35 30 2c 34 35 32 2e 31 32 35 30 2c 34 35 32 2e 31 32 35 30 2c 34 35 33 2e 31 32 35 30 2c 34 35 33 2e 31 32 35 30 2c 34 35 34 2e 31 32 35 30 2c 34 35 34 2e 31 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 36 2e 31 32 35 30 2c 34 35 36 2e 31 32 35 30 2c 34 35 37 2e 31 32 35 30 2c 34 35 37 2e 31 32 35 30 2c 34 35 38 2e 31 32 35 30 2c 34 35 38 2e 31 32 35 30 2c 34 35 39 2e 31 32 35 30 2c 34 35 39 2e 31 32 35 30 2c 34 35 35 2e 30 32 35 30 2c 34 35 35 2e 30 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 35 2e 31 32 35 30 2c 34 35 35 2e 32 32 35 30 2c 34 35 35 2e 33 32 35 30 2c 34 35 35 2e 33 32 35 30 2c 34 35 35 2e 34 32 35 30 2c 34 35 35 2e 34 32 35 30 2c 34 35 35 2e 35 32 35 30 2c 34 35 35 2e 35 32 35 30 2c s30 31 31 2c 31 32 35 2c 38 0d 0a)

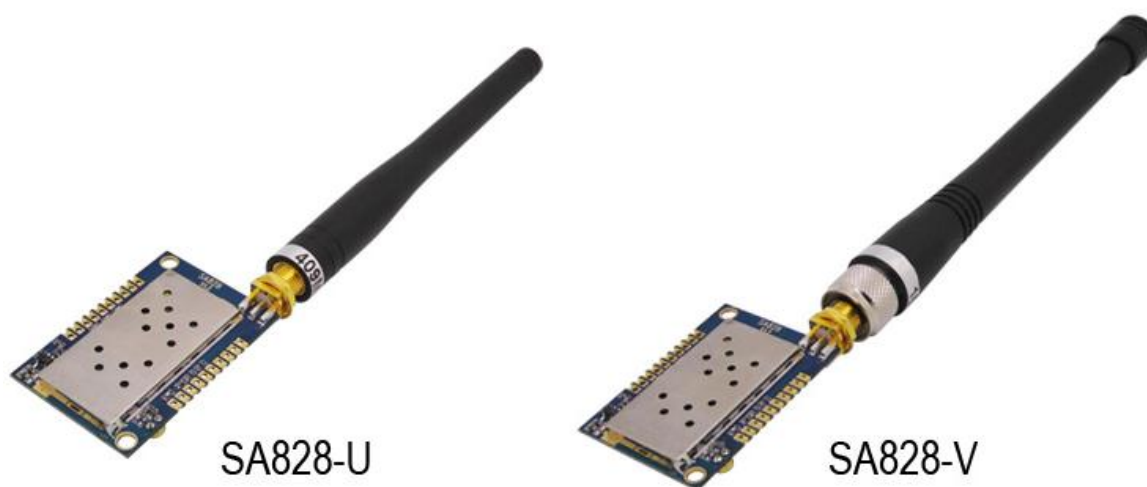
Return instruction: "OK\r\n" or "ERROR\r\n"

OK\r\n (Hex 4f 4b 0d 0a)

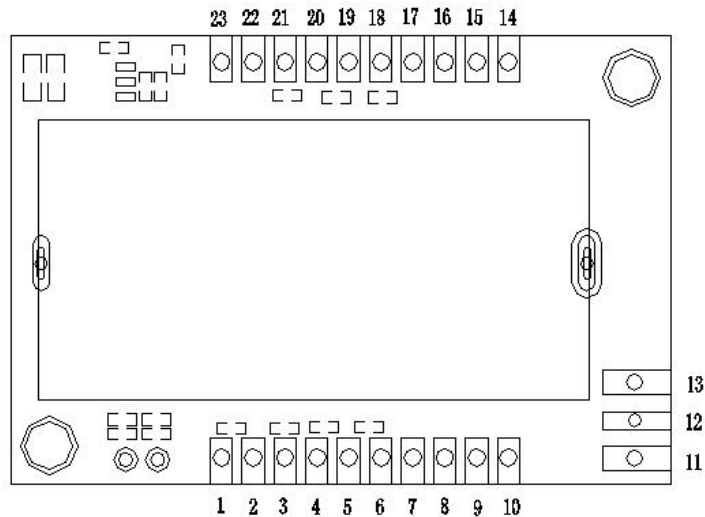
10. Accessories

1) Antenna

The antenna is very important for RF communication. Its performance will affect the communication . The module requires the antenna with 50Ω impedance. Universal antennas are Rod antenna, sucker antenna and telescopic antenna, User can choose the right antenna according to their application. We advise to use antennas listed on our website to get better performance.

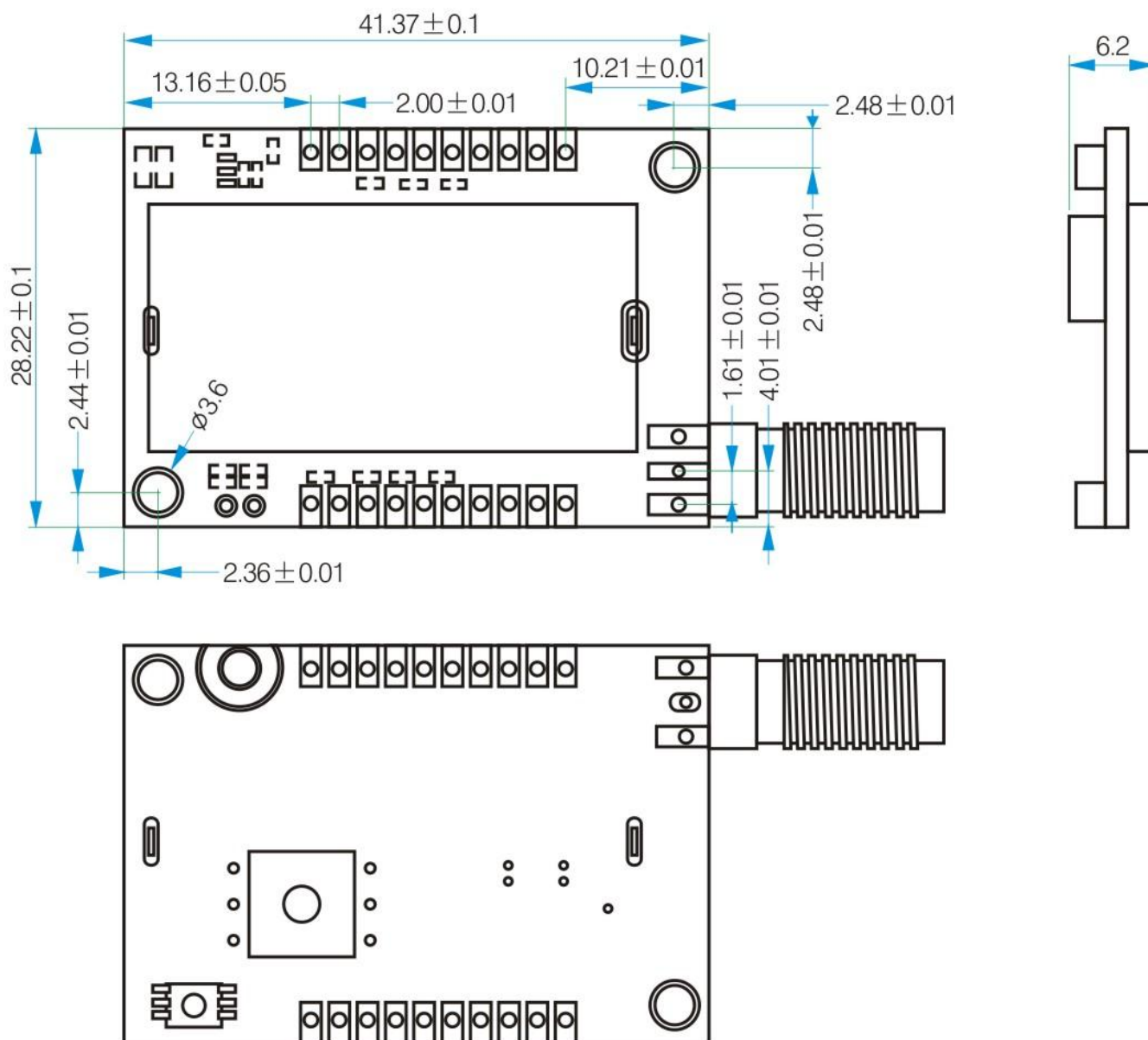


11. Pin definition



Pin NO.	Pin name	Description
1	MIC+	External microphone positive
2	MIC-	External microphone cathode
3	VOXEN	VOX enable , 0: enable VOX; leave open or 1 to disable VOX
4	1	Encoding for 16 channel, 4bit organized the 16 channels. For example, if the bit is : 0110, it is channel 6. If it is 1001, it is channel 9. The Pin marked 8 means the maximum bit. The Pin marked 1 means the lowest bit.
5	2	
6	8	
7	4	
8	H/L	High/low output power control; Leave open for high output power , low level to low output power.
9	SPKEN	Receive signal indicatie Pin, usually low level, turn high after receiving signal
10,11,13,21	GND	Exposed ground pad
12	ANT	Output for RF signal, External connect antenna with 50ohm
14,15	SPK	Output for Audio, External connect loudspeaker with 8 ohm /2W
16,17	VOL	Audio volume control, External connect 100K ohm rotary resistor
18	RXD	RXD of the module for UART, connect to TXD outside of the module
19	TXD	TXD of the module for UART, connect to RXD outside of the module
20	PTT	PTT of the walkie-talkie module, leave open or “1” is Rx, “0”is TX, Default receiving mode
22	VCC	External connect Positive supply 3.3~5V.
23	CS	“0” is for sleeping mode, ”1” for normal working, , Default normal operation

12. Mechanism Dimension(Unit:mm)



13. Order information

Product Name	Description
SA828-U	Working frequency :400~470 MHz
SA828-V	Working frequency: 134~174 MHz
SA828-350	Working frequency: 320-400 MHz

14. FAQ

- a) Why module can not communicate properly?
 - 1) Check if there is power connection error;
 - 2) Check if Module is in normal communication mode;
 - 3) Check if frequency, channel, and mute are same;
 - 4) Check if module is damaged;
- b) Why transmission distance is not far as it should be?
 - 1) Power supply ripple is too large;
 - 2) The antenna types do not match, or not installed properly;
 - 3) The same frequency interference;
 - 4) The surrounding environment is harsh, strong interference sources.

Appendix 1: Display and Sending Table of CTCSS/CDCSS

Sending	display		Sending	display		Sending	display
000	0		039	023I		122	023N
001	1		040	025I		123	025N
002	2		041	026I		124	026N
003	3		042	031I		125	031N
004	4		043	032I		126	032N
005	5		044	043I		127	043N
006	6		045	047I		128	047N
007	7		046	051I		129	051N
008	8		047	054I		130	054N
009	9		048	065I		131	065N
010	10		049	071I		132	071N
011	11		050	072I		133	072N
012	12		051	073I		134	073N
013	13		052	074I		135	074N
014	14		053	114I		136	114N
015	15		054	115I		137	115N
016	16		055	116I		138	116N
017	17		056	125I		139	125N
018	18		057	131I		140	131N
019	19		058	132I		141	132N
020	20		059	134I		142	134N
021	21		060	143I		143	143N
022	22		061	152I		144	152N
023	23		062	155I		145	155N
024	24		063	156I		146	156N
025	25		064	162I		147	162N
026	26		065	165I		148	165N
027	27		066	172I		149	172N

028	28		067	174I		150	174N
029	29		068	205I		151	205N
030	30		069	223I		152	223N
031	31		070	226I		153	226N
032	32		071	243I		154	243N
033	33		072	244I		155	244N
034	34		073	245I		156	245N
035	35		074	251I		157	251N
036	36		075	261I		158	261N
037	37		076	263I		159	263N
038	38		077	265I		160	265N
			078	271I		161	271N
			079	306I		162	306N
			080	311I		163	311N
			081	315I		164	315N
			082	331I		165	331N
			083	343I		166	343N
			084	346I		167	346N
			085	351I		168	351N
			086	364I		169	364N
			087	365I		170	365N
			088	371I		171	371N
			089	411I		172	411N
			090	412I		173	412N
			091	413I		174	413N
			092	423I		175	423N
			093	431I		176	431N
			094	432I		177	432N
			095	445I		178	445N
			096	464I		179	464N

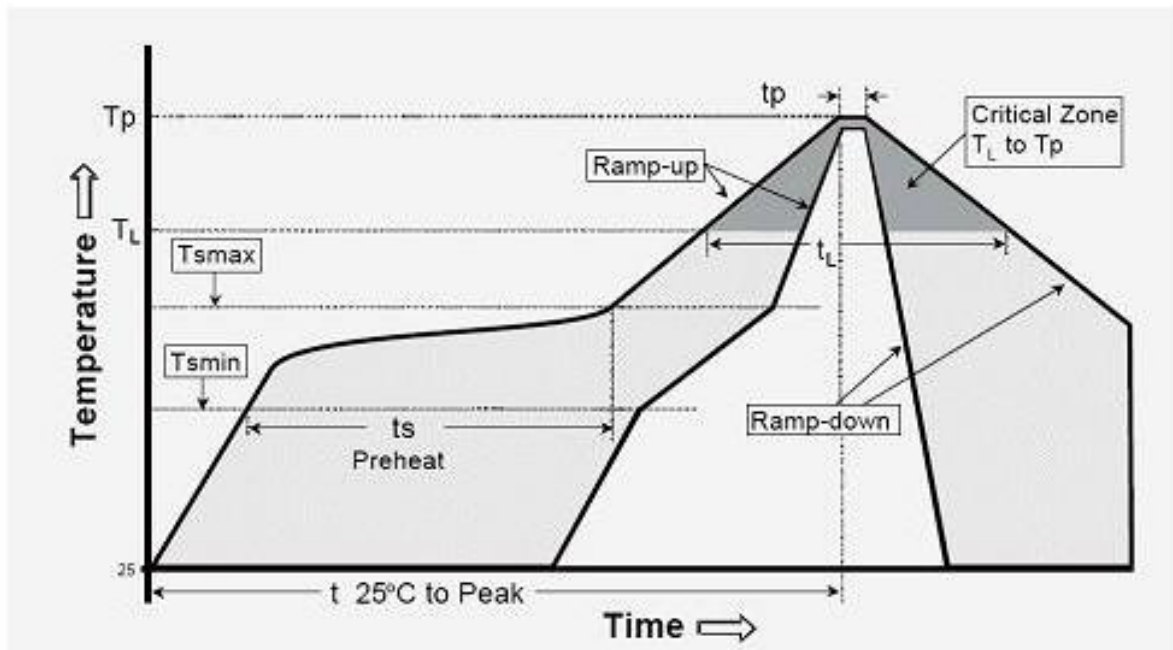
			097	465I		180	465N
			098	466I		181	466N
			099	503I		182	503N
			100	506I		183	506N
			101	516I		184	516N
			102	532I		185	532N
			103	546I		186	546N
			104	565I		187	565N
			105	606I		188	606N
			106	612I		189	612N
			107	624I		190	624N
			108	627I		191	627N
			109	631I		192	631N
			110	632I		193	632N
			111	654I		194	654N
			112	662I		195	662N
			113	664I		196	664N
			114	703I		197	703N
			115	712I		198	712N
			116	723I		199	723N
			117	731I		200	731N
			118	732I		201	732N
			119	734I		202	734N
			120	743I		203	743N
			121	754I		204	754N

Appendix 2: Analog subtone comparison table

Subtone coding	1	2	3	4	5	6	7	8	9	10
Sub-audio frequency	67	71.9	74.4	77	79.7	82.5	85.4	88.5	91.5	94.8
Subtone coding	11	12	13	14	15	16	17	18	19	20
Sub-audio frequency	97.4	100	103.5	107.2	110.9	114.8	118.8	123	127.3	131.8
Subtone coding	21	22	23	24	25	26	27	28	29	30
Sub-audio frequency	136.5	141.3	146.2	151.4	156.7	162.2	167.9	173.8	179.9	186.2
Subtone coding	31	32	33	34	35	36	37	38		
Sub-audio frequency	192.8	203.5	210.7	218.1	225.7	233.6	241.8	250.3		

Appendix 3: SMD Reflow Chart

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 $\geq 2.5\text{mm}$)
The ramp-up rate (Tl to Tp)	3°C/s (max.)
preheat temperature	
- Temperature minimum (T _{smin})	150°C
- Temperature maximum (T _{smax})	200°C
- preheat time (t _s)	60~180s
Average ramp-up rate(T _{smax} to T _p)	3°C/s (Max.)
- Liquidous temperature(T _L)	217°C
- Time at liquidous(t _L)	60~150 second
peak temperature(T _p)	245+/-5°C