SR_FRS_2WUS

Walkie Talkie Transceiver /Data transfer Module

UHF(400M-470M)

DATA SHEET
(V101)

SR_FRS_2WUS

尚瑞思电子

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2. Product Outline

The SR_FRS_2WUS   is a low cost but high performance integrated walkit talkie module. With built-in high performance micro controller, narrow band rf transceiver and standard Uart interface,it can be easily used and succeed in all the walkie talkie function with good quality voice and long distance transmission. Users only need to connect external audio amplifiers, microphone or speaker with this module ,then it can work as a small walkie talkie with 2W output . In open area, it can come to performance of 9Km communication. Simplified interface and ultra small size make this module into a wide range of applications, also can conveniently embed into various handheld devices,to improve the comprehensive performance of end products.

Besides the   excellent voice intercom, The more important feature is this module has the data/SMS transfer ability; up to 70 byte can be sent at one time;   it   is compliance with the standard UART transfer protocol;

3. Product performance

- FM demodulation technique Based on digital signal processing technology；
- Frequency Range：UHF 400M～470MHZ；
- Frequency step：5K/6.25K/12.5K/25K；
- RF Output Power：2W/1W/0.5W
- voice encryption (scrambling): 8 type.
- Voice Compression- Expansion ；
- SMS Receive /Transformer，The space Baut : 1200；
- CTCSS（38 group）+ CDCSS（83 group） ；
- Automatic elimination tail ；
- Volume adjustable（1-8）；
- Vox level adjustable（0-8）；
- SQ level adjustable（0-9）；
- MIC sensitivity level adjustable（1-8）
- The ultra low power dissipation in Sleep Mode（0.1uA）；

- Power supply ：DC 3.3～5.0V

- Ultra small size：17*28.5*3.0mm

- Communication distance：more than 9 KM in open area .

Applications：

portable intercom and paging systems；

wireless data transmission；

mobile phones and other   embedded in radio   functions   product 。

Portable walkie-talkie,
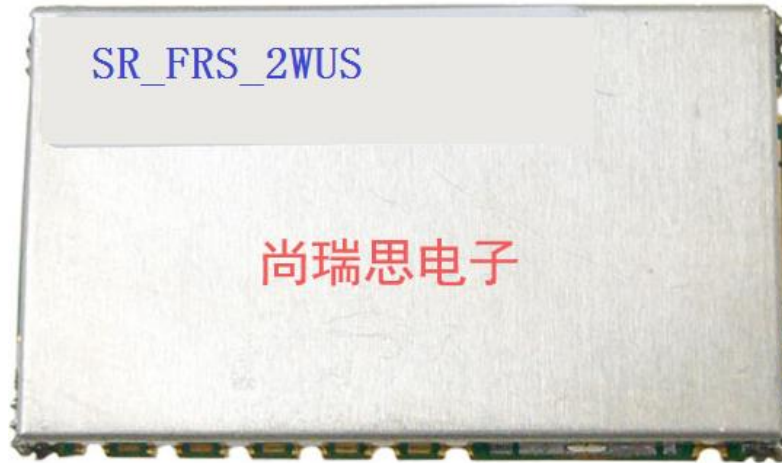
Outdoor sports equipment,

Building security,

Audio monitor system

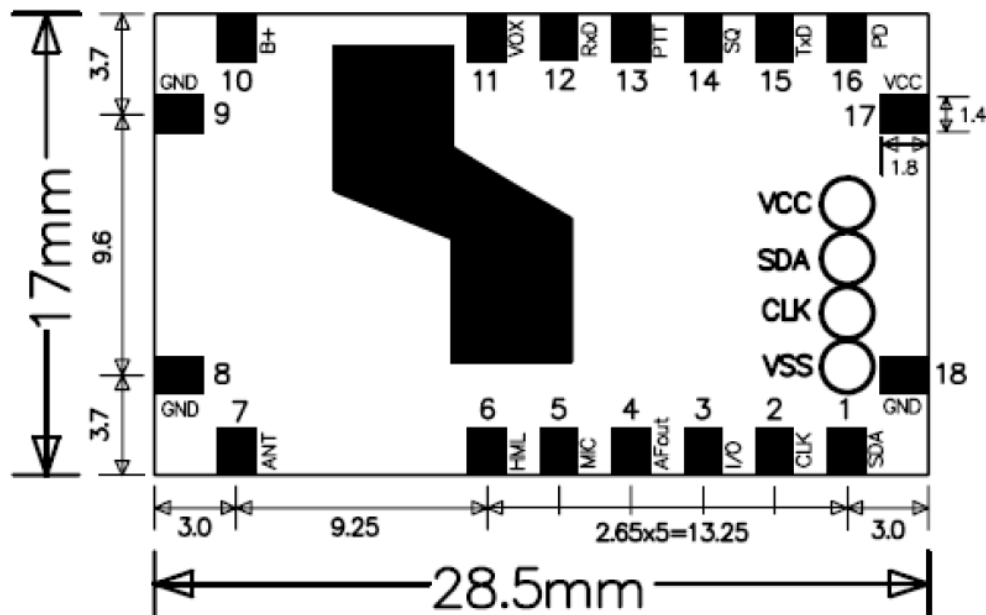## 4. Module package

4.1 Module pin assignment for TOP VIEW.

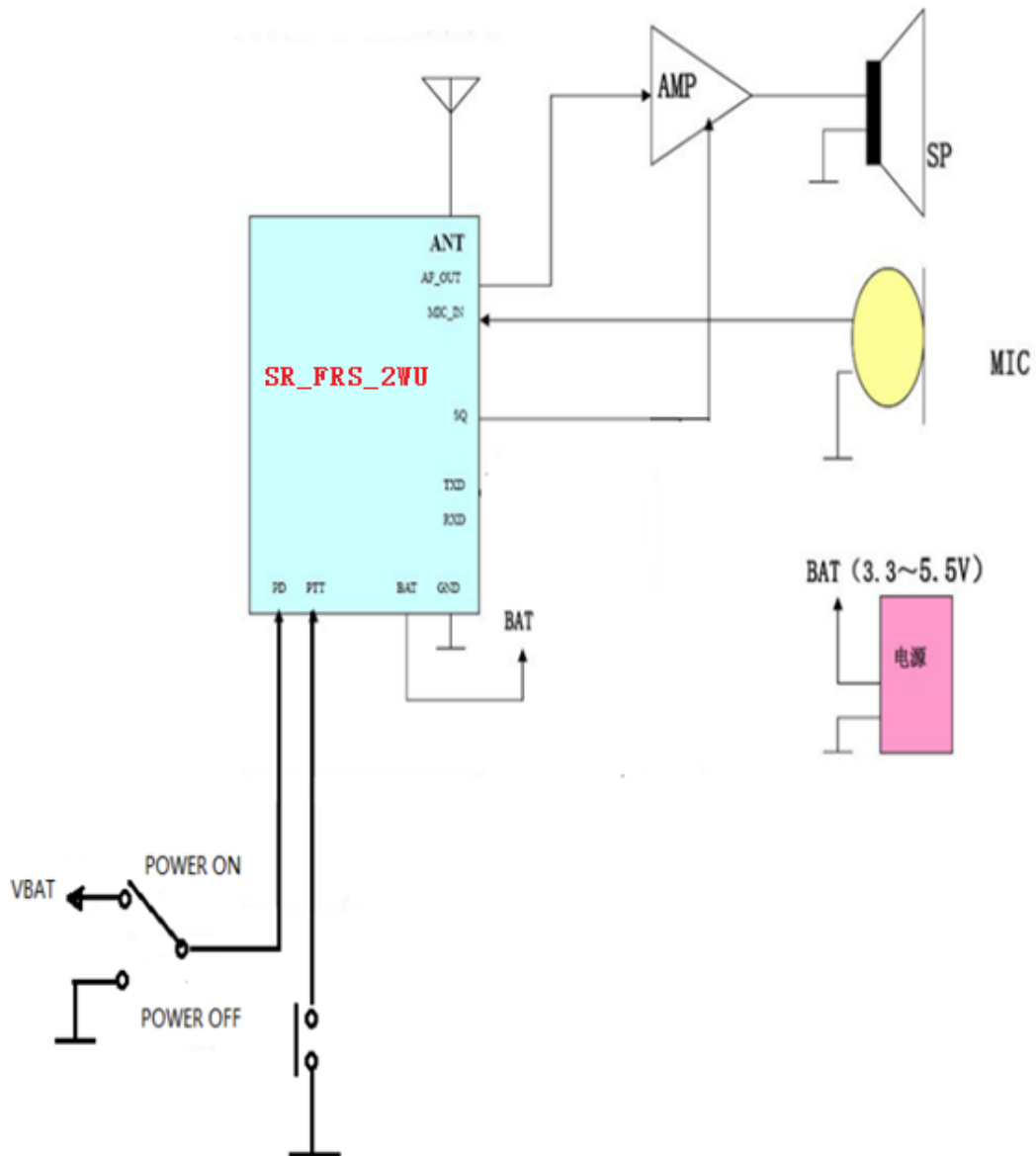**Top   view**

4.2   Module   package size

Bottom View

4.3 Module pin assignment description

Pin number	pin name	IO	Function description
1	SDA		Program only, user unused
2	CLK		Program only, user unused
3	I/O		Program only, user unsed.
4	AF_OUT	OUT	Audio output
5	MIC	IN	Micphone input
6	HML	IN	Transmit power selection: 　　GND: 0.5w 　　NC:　2W 　　1.5V: 1W　(unuseful)
7	ANT	IN/OUT	Antenna
8	GND	GND	GND
9	MIC_IN	IN	Microphone input;
10	B+	OUT	Module power supply
11	VOX	OUT	1）with VOX mode，it is the VOX state indication； 　0：　Talk finished； 　1：　Talking； 2）without VOX，it is the transmitter state indication； 　0：　receive state 1：　transmitter state
12	RXD	IN	UART_RXD
13	PTT	IN	PTT control 1：Receive； 0：Transmit
14	SQ	OUT	Squelch control 0: active
15	TXD	OUT	UART_TXD
16	PD	IN/OUT	Module power control: 1: Power on 0: Power off
17	VCC		+3V output
18	GND	GND	

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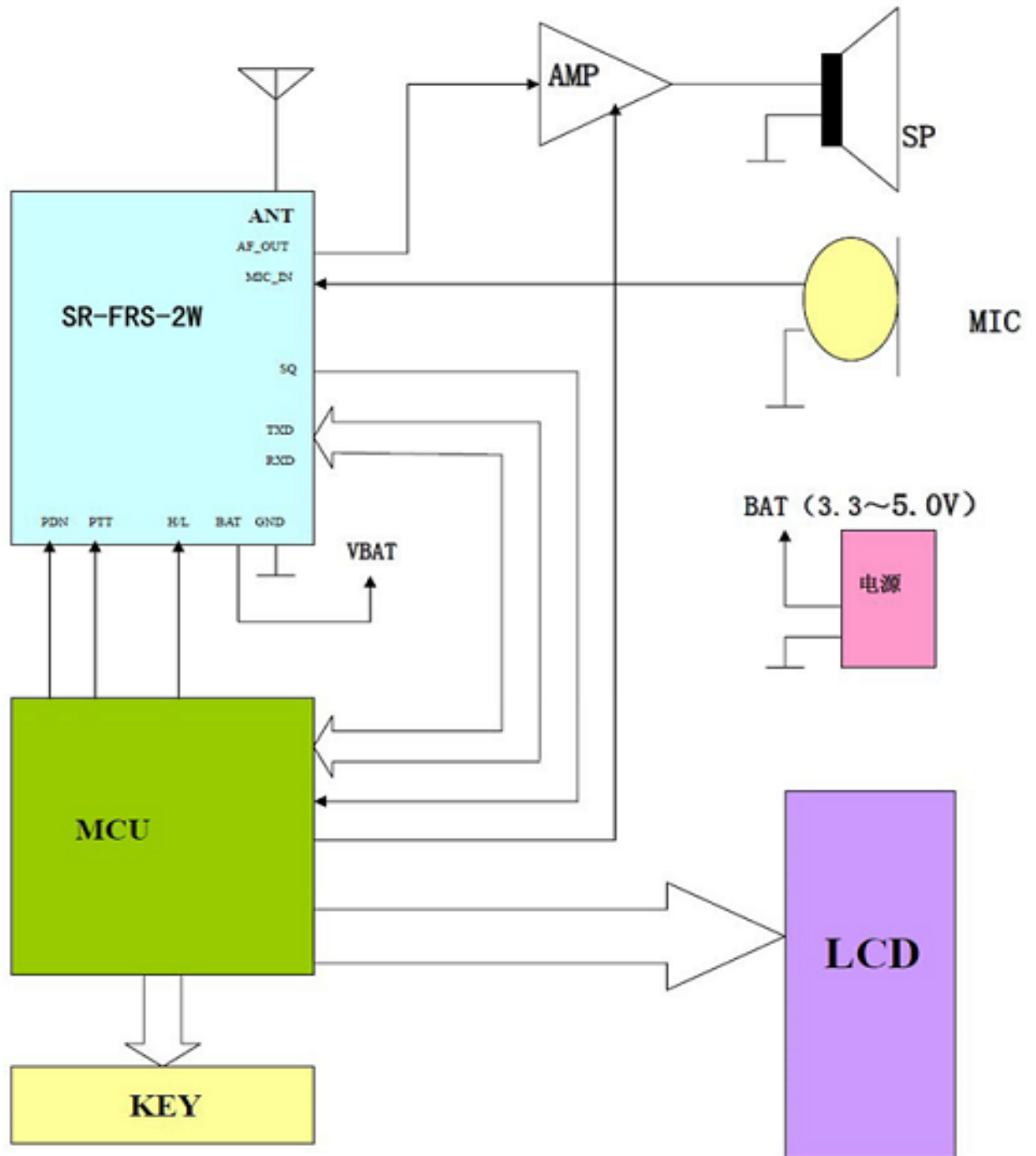
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5. Typical application Block diagram

5.1 without MCU, it works alone

5.2 Works with MCU

6. Electrical Characteristics

6.1 DC Electrical Characteristics (Recommended)

Symbol	Description	Min	Typical	Max	unit
VBAT	Power supply	3.3	3.7	4.2	V
Tamb	Ambient temperature	-20	27	60	℃
	Internal Initialize Time when power on	400	500		ms
	CMOS low level	0		0.6	V
	CMOS high level	2.4		3	V

Notes: VCC = 3V(for control port voltage）

6.2 DC Electrical Characteristics (Maximum)

Symbol	description	Min	Typical	Max	unit
VBAT	Power supply	3.3	4.2	5.0	V
Tamb	Ambient temperature	-30		85	℃
I_{IN}	I/O input current	-5		5	mA
V_{IN}	I/O input voltage ）	-0.3		3.3	V

6.3 Power Characteristics

(Test conditons: VBAT = 4.0V , T_A= -25 to 85 ℃)

Work mode	description	Test condition	Typical	unit
Continuous Receive	The receiver is in normal work mode	Input 450.050MHz,RF level -47dBm，AF=1KHz,MOD=1.5KHz	40	mA
Continuous Transmit	The transmitter is in normal work mode	Input 1KHz Modulated signal HI power MI power LO power	1200 700 350	MA MA MA

Receive Squelch power Save mode	The receiver is in power save state with standby condition.		15	mA
Deep sleep (PDN Is low)	Both the receiver and transmitter are all power off.	Within 500ms finish the power on process，switch to continuous receive/transmit mode。	0.1	uA

6.4   Overall electrical performance specifications

Frequency Range（MHz）	400-470
Channel spacing（KHz）	25 / 12.5KHZ
Antenna Impedance (Ω)	50
Operating temperature（℃）	-20～+55
Frequency Stability（ppm）	±2.5

6.5 Receive Performance

(unless special comment，Test condition VBAT = 4.0 V, TA = -25 ℃)

Symbol	description	Test condition	Min	Typical	Max	unit
f$_{IN}$	Rf frequency range	UHF	400		470	MHz
Sensitivity	Reference sensitivity	12dB S/N for Audio output	-120	-122		dBm
	Squelch Sensitivity	Adjustable by software		-120		
	Received SNR	1.5KHZ Deviation	52	55		
	Adjacent Channel Selectivity	12.5KHz Deviation	52	55		dB
	Intermodulation Immunity	12.5KHz Channel spacing	52	55		
	Spurious response rejection	12.5KHz Channel spacing	52	55		dB
AF OUT	Audio Output (RMS)	Fo=1KHz Adjustable by software		150	150	MV
	Audio output distortion	Fo=1KHz		1	3	%
	Audio response	300HZ 500HZ 1KHZ 3000HZ		+4.5 +5.5 0 -13		

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6.6 Transmit Performance

(unless special comment，Test condition VBAT = 4.0 V, TA = -25 ℃)

Symbol	Description	Test condition	Min	Typical	Max	unit
Fout	Rf frequency range		400		470	MHz
Pout	Rf Transmit power Hi Mi Lo		1700 800 350	2000 1000 450	2100 1200 500	MW
	Transmit current Hi Mi Lo			1200 750 350	1300 850 400	MA
	Maximum modulation frequency deviation limit	Narrow bandwidth Broadband			2.5 5.0	KHZ KHZ
	Modulation sensitivity	8 Level adjustable by software	5	7	12	MV
	Audio modulation distortion			1	3	%
	Modulation characteristics	300HZ 500HZ 1000HZ 3000HZ	-5 3	-13 -6 0 6	-9 9	DB DB DB DB
SNR	S/N		40	42	45	dB
	Carrier suppression			-60		dBc
	IM3 Suppression			-60		dBc
	Adjacent Channel Power	12.5KHz offset		-60		dBc
	Stray radiation			-36		dBc

7. Comment：

1、 The default parameter for this module after power on are as bellow:

GBW=12.5KHZHZ，

TFV=450.050MHZ,

RFV=450.050MHZ，

CTCSS=00， （For both Transfer and receive)

SQ=3,

Voice encryption :   OFF

2、 The PTT pin cann't be pulled to Lo when in data transfer mode.

UART communication protocol

VER01

1 Outline

SR-FRS-2WUS   module has a standard AT command interface, it is easily to communicate with and control the module;

The AT command involved all the inquiry and control   to the module, You may select the command to use as needed.

1.1 AT command type

1) Command without parameter：

AT＋<command>,   eg.:   AT+DMOCONNECT

2) Command with parameter：

AT＋<command>=<par1>,<par2>,<par3>…

3) Response command format are as below :

<CR><LF><command string><CR><LF>

<CR> Enter，0x0D

<LF> Newline，0x0A。

1.2 AT Command format

All the AT command started with "AT", And ended with<CR>。

The UART port default setting are as below:

◆   8 bit data,

◆   1 bit stop,

◆   without parity,

◆   CTS/RTS,

◆9600 baut

AT command response format：

<CR><LF><command string><CR><LF>

2 the communication command   format

2.1   The command frame format define

The communication format are as   AT instruction。

All data are as **ASCII** code, except the Length of SMS are **Hex** code.

The control command format：

AT+DMOXXX

The module response command format:

+DMOXXX

2.2 The control command list

2.2.1 **AT+DMOGRP**   (Group setting command)

Description	Bandwidth, frequency, CTCSS, SQ setting command;	
Command	AT+DMOGRP=RFV,TFV,RXCT,TXCT,Flag,Flag1	
Example	Host Command	AT+DMOGRP=450.02500,450.02500,7006, 7006,0,0 **(enter)**
	Module Response command	**+DMOGRP:0** Success **+ DMOGRP:1** Failure
comment	**TFV**：Transmit frequency: 　UHF: 400.0000M-470.0000M HZ （It should be the integer multiple of 6.25K or 5K ）	
	RFV：Receive frequency： 　UHF: 400.0000M-470.0000M HZ （It should be the integer multiple of 6.25K or 5K ）	
	RXCT ： CTCSS/CDCSS ， for receive coding **TXCT** ： CTCSS/CDCSS ， for transmit coding 　　2bytes,(HEX code); 　　RXCT lower 4 bit is for decimal part , if no setting then filled with "FF FF" Eg: CTCSS: 67.7 HZ D0D1 = 0X77 0X06 　　CDCSS: D023N D0D1 = 2380 　　　　　　 D023N D0D1 = 4482 　　　　　　 D023N D0D1 = 23C0 　　　　　　 D023N D0D1 = 51C2	

	FLAG ：(ASCII format)
	
	    Bit0 : busy locking / 0:OFF 1:ON
	
	    Bit1: band setting / 0: Wide 1:Narrow
	
	FLAG 1：(ASCII format)
	
	    Bit0 : HI/LO transmit power/ 0: 2W 1: 0.5W
	
	    Bit1: Middle transmit power / 0: 2W/0.5W 1: 1w

1)Command example:

41 54 2B 44 4D 4F 47 52 50 3D 34 35 30 2E 30 32 35 30 30 2C 34 35 30 2E 30 32 35

30 30 2C FF FF 2C FF FF 2C 30 2C 30 0D 0A

2) Comment for CTCSS /CDCSS setting:

A) for analog CTCSS setting

Eg1： **67.0** treated as 4 digit integer **0670**; while **D0 D1** should be **0x70 0x06** , so
   the RXCT/TXCT should be setting to be **7006**

Eg2 **250.3** treated as 4 digit integer **2503**, while **D0 D1** should be **0x03 0x25** , so
the RXCT/TXCT should be setting to be **0325**

B) for digital CDCSS setting

For Positive CDCSS code: MSB of D1 is **8**;

eg: D023N   D0 D1=23 80

    D244N   D0 D1=44 82

For Negative CDCSS code: MSB of D1 is **C**;

Eg: D023I D0 D1=23 C0

   D251I D0 D1=51 C2

3) FLAG /FLAG1 Setting

BIT1 BIT0 is BCD type;

  If BIT1 is set to 1, then its BCD1 is 2, otherwise it should be 0;

  If BIT0 is set to 1, then its BCD0 is 1, otherwise it should be 0;

 So the final value of FLAG/FLAG1 equal the sum of BCD1 and BCD0;

Eg:

1) FLAG:

Bit1 = 1; bit0 = 0

The BCD of FLAG is 2 + 0 = 2; FLAG = 2;

2) FLAG:

Bit1 = 1; bit0 = 1

The BCD of FLAG is 2 + 1 = 3; FLAG = 3;

2) FLAG:

Bit1 = 0; bit0 = 1

The BCD of FLAG is 0 + 1 = 1; FLAG = 1;

2.2.3   **AT+DMOSAV** (Auto power save command)

Description	Module auto power save setting	
Command	AT+DMOSAV=X	
Example	Host command	AT+DMOSAV=0**(Enter)**
	Module Response command	+DMOSAV:**0** Success +DMOSAV:**1** Failure
comment	X: 0 Enable power save （default） 1 Disable power save	

Comment：

1. When for message sending/Data transfer application，Please disable power save for fast transmit and receive。

2. When for VOX application, Please disable power save.

2.2.4   **AT+DMOVER**   (Inquiry module version command)

Description	Inquiry the module software version	
command	AT+DMOVERQ	
Example	Host command	AT+DMOVER(Enter)
	Module Response command	+DMOVER：V0.1
comment	The response of module is the module software version.	

2.2.5 **AT+DMOVOL**   (Volume setting command)

Description	Volume setting	
Command	AT+DMOVOL=X	
Example	Host command	AT+DMOVOL=1**(enter)**
	Module response command	+DMOVOL：0 Success +DMOVOL：1 Failure
Comment	X： 1-8 （default: 8）	

2.2.6 AT+DMOVOX   (Acoustic control command)

Description	Acoustic control setting	
Command	AT+DMOVOX=X	
Example	Host command	AT+DMOVOX=0**(enter)**
	Module response command	+DMOVOX：0 Success +DMOVOX：1 Failure
Comment	X：Acoustic control level（0-8） （0: Means VOX OFF, default value）； LEVEL1~12MV LEVLE5~7MV LEVEL8~5MV	

Tips:

1) The number more big, the sensitivity more high;
2) When VOX ON, the Auto power off should be disabled,
   that is：AT+DMOAUTOPOWCONTR=1;

2.2.7 **AT+DMOFUN**   (extension function setting)

Description	Microphone sensitivity & Voice scram setting command	
Command	AT+DMOFUN=SQL，MICLVL, TOT，SCRAMLVL ,COMP	
Example	Host command	AT+DMOFUN=3,1,0,0,0**(enter)**
	Module response command	+DMOFUN：0 Success +DMOFUN：1 Failure

Comment	MICLVL：Mic sensitivity level (1-8), default value is 6 ; The lever is more big ,and the sensitivity is more high;
	SQ：Squelch level：(**0-9**, 0：Monitor mode）
	MICLVL：Mic sensitivity level: (**0-7**)
	TOT：Transmit timer limit（**0~15** minute , 0: means OFF）
	SCRAMLVL：voice scram (**0-7**, 0: means OFF)
	COMP: Compress and extend setting: 0: OFF. 1: ON

2.2.8 **AT+DMOMES** (Short message sending / Data transfer command)

Description	Host send message or data to module for transmit
Command	AT+DMOMES=[Message Lenth]XXX
Example	**Host command**	AT+DMOMES=7ABCDEFG**(enter)** (41 54 2B 44 4D 4F 4D 45 53 3D 07 41 42 43 44 45 46 47 0D 0A)
	Module response command	+ DMOMES:0 Success + DMOMES:1 Failure
Comment	[Message Lenth]： the message length (Max **60** Bytes)，it is HEX code, only one Byte.
	XXX：is the message contents.

Tips：

1. For fast transmit and receive SMS， Please disable Auto power off;

   That is : (AT+DMOSAV =0);

2. [Message Lenth] is HEX code.

   If send the command from PC, Please be noted that , once type the command by "**TEXT**", the [Message Lenth] would be treated as one or two bytes, it caused the wrong message be sent. So, it is necessary to modify the message length into one byte by hand under the "HEX" mode before send the message.

   For example: AT+DMOMES=7ABCDEFG

                   The length number 7 would be treated as 37;

                   AT+DMOMES=12ABCDEFABCDEF

                   The length number 12 would be treated as 31 32

2.2.9 **+DMOMES** (The module received the message and

automatically send to HOST)

Description	The module received the message and automatically send to HOST	
Command	+DMOMES=[Message Lenth]XXX	
Example	Module send the message to Host	+DMOMES =7ABCDEFG (2B 44 4D 4F 4D 45 53 3D 07 41 42 43 44 45 46 47 0D 0A)
	Host response to Module	AT+DMOMES：**0** Success AT+DMOMES：**1** Failure
Comment	[Message Lenth]：is the message length(Max 100 bytes)，**HEX** code。	
	XXX：is the message contents.	

Tips:

1. If the message length is Odd number, a "space" should be added behind the last character of

   message;

2. Host response to Module command is not must.

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Appendix:

Demo board for SR_FRS_2WUS
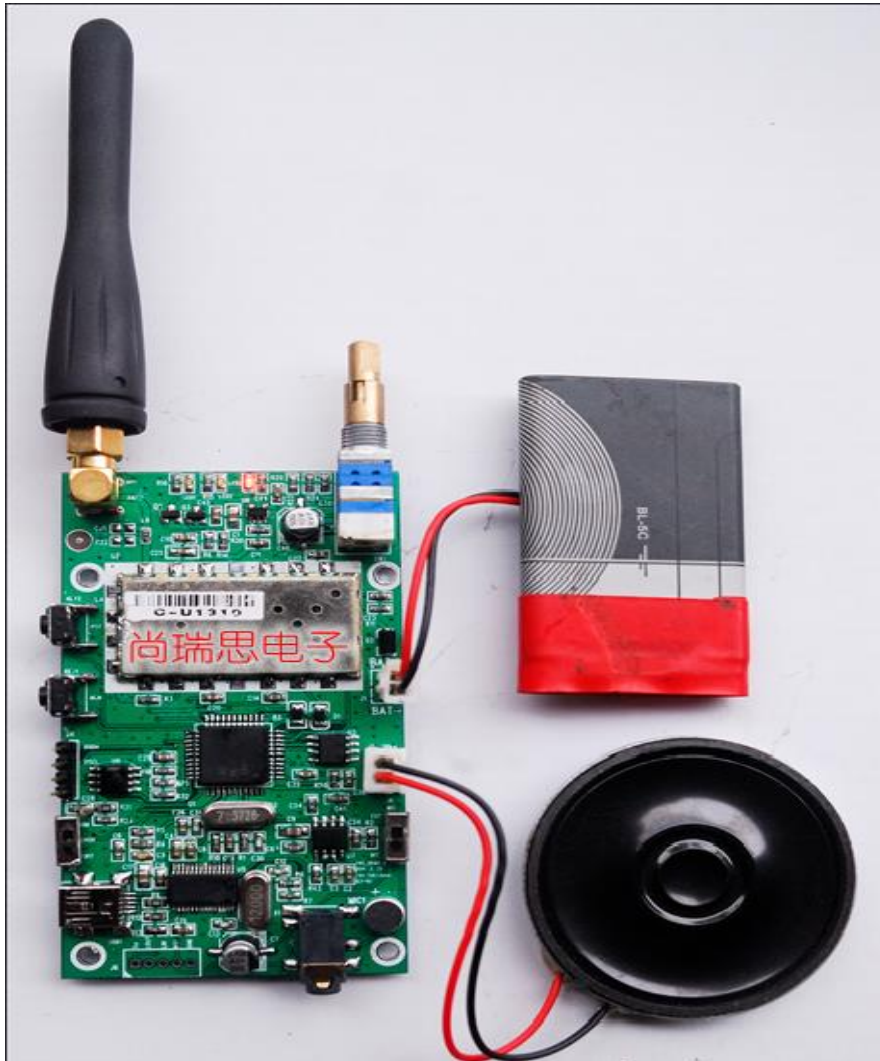
1. FRS_DEMO_A

1） The demo board is for SR_FRS_1W /SR_FRS_2W   module demonstration;

2） It can be used for either UHF or VHF module demo.

3） It work alone without MCU；

4） It built in RS232 convert circuit, it is easy for user to connect the test board with the PC for parameter setting, or Data transfer demo;

5) It has the speaker Mic jack; Just through the speaker Mic you may implement the voice intercom; (it must use the speaker Mic we provided)

6) Power polarity protection;

7) Only one default frequency could be used.

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2. FRS_DEMO_B

1） Can be used for SR-FRS-1W U/V , SR_FRS_0W5 ,SR_FRS_2W module demonstration;

2） It can support both UHF（400M-480M） and VHF(136M-174M)；

3） Power ON/OFF, Volume adjust, Channel adjust 3 in 1 switch；

4） 16 Channels can be selected；

5） Enable or Disable VOX is easy by VOX switch control; The VOX sensitivity can be set via the PC；

6） Voice broadcast the channel number; Chinese/ English can be selected；

7） Monitor ON/OFF by [MON]key；

8） Voice intercom demo；

9） Data /SMS transfer demo；

10) Provide user interface: SQ,LINE_IN, LINE_OUT,PTT,GND；

11) Restore to be the factory setting；

12) USB interface for parameter setting by connect the demo board to the PC.

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3. FRS_DEMO_D

1） The demo board can   be used for   SR_FRS_0W5, SR_FRS_1W, SR_FRS_350, SR_FRS_2W module demonstration;

2） It support both UHF and VHF;

3） LCD with 128X64 pix;

4） Encode switch   with press switch make the operation is more easy;

5） All parameter can be set by the demo board itself or via the PC;

6） Both Tx frequency and Rx frequency can be set alone;

7） Both Tx CTCSS and Rx CTCSS can be set alone;

8） 100 channels;

9) Voice intercom demo

10） Auto scan demo

11) Sms Demo

12） Monitor;

13） Many interface for the user;

14) Li battery charge;