

FM Receiver Module FM Stereo Digital Radio

Product Features:

- 1: Adopt advanced digital audio signal processing (DSP) and FM modulation phase-locked loop (PLL) to make the sound more realistic, the performance is more stable, the working time is long, and there is no frequency deviation.
- 2: The LCD display is more intuitive and accurate, with very low power consumption and minimal noise.
- 3: You can search for radio stations and store the radio function, which is easy to operate.
- 4: Built-in 30 digital volume adjustment buttons can be easily completed.
- 5: Automatically shut down the memory data before power failure.
- 6: Automatic switching of speaker/headphone output
- 7: The frequency of the quartz crystal is stable, and the temperature change will no longer receive frequency drift.
- 9: Professional audio DSP audio signal analysis and processing, automatically mute no signal or weak FM signal when the noise is large, away from traditional FM radio signal or weak signal, no annoying rustling.
- 10: The digital incremental rotary encoder adjusts the volume and frequency of use with a good feel, accurate positioning, stable and durable, and 360° rotation without dead ends.
- 11: 30-level digital volume adjustment range
- 12: Support serial communication control, use other computers or devices to control the MCU module, with full serial functions.

Product parameters:

Output power: 500mW (driving headphones), 3Wx2 (driving speakers)

Frequency response range: 50Hz-18KHz

Receiving frequency range:

Close the campus broadcast 87.0MHz-108.0MHz,

Open campus broadcast 76.0MHz-108.0MHz

Equivalent noise: ≥ 30 dB

Supply voltage: 3.0V-5.0V

Supply current: 1000mA at maximum volume, 60mA at minimum volume (for reference only)

Channel: Stereo

<1>: Power

The corresponding ports of the module (marked on the PCB board) - and + are respectively connected to the negative and positive poles of the power supply (battery). It is recommended to use a battery or other regulated power supply for the power supply. Switching power supplies

without filters (such as mobile phone chargers, mobile power supplies, and other switching power supplies) cannot be used, otherwise the interference generated by the power supply will affect the normal operation of the module. The normal working voltage of this module is 3.0-5.0V, and the power supply voltage should not exceed this range. The maximum power supply current of this module is about 1A at the maximum volume, and the battery needs to be able to output enough current.

Note: The radio (any radio) is a radio-sensitive device, and interference from the power supply or nearby may affect the normal operation of the module. Therefore, it is recommended to use a battery or a power frequency transformer to obtain a stable voltage after voltage stabilization for the power supply to the module. Switching power supplies (such as mobile phone chargers, and any other switching power supplies), power banks, switching DC-DC converters, and Class D power amplifiers, microwave ovens and other devices that can generate high-frequency electromagnetic interference cannot be used nearby. Otherwise, the electromagnetic interference generated by these devices will be coupled to the RF front-end of the module through space, causing the received and restored signals to generate noise.

<2>: Antenna

The FM_ANT port is used to connect the FM antenna. In order to better receive the FM signal, it is recommended to connect a 75cm long rod antenna.

<3>: Headphone/Speaker output

This module comes with a 3WX2 channel audio power amplifier. If the speaker needs to be connected to the speaker port, it is recommended to use a 4 Ω /3W speaker. If you insert headphones, the audio is automatically switched to the headphone channel, and the speaker channel is automatically turned off.

<4> Volume adjustment

Turn the VOL encoder to adjust the volume, and the LCD screen displays the volume level.

<5> Frequency adjustment

Turn the FRE encoder to adjust the receiving frequency, while the LCD screen displays the current frequency, and the encoder handle is pressed down to switch between mute/unmuted.

<6> Mute

Short press the VOL knob down to toggle mute/unmute

<7> Automatic squelch switch

Press and hold the FRE knob downward to switch the automatic squelch function on or off. The LCD displays the subtitles ON to open the automatic squelch, and OFF to close the automatic squelch.

<8> Auto squelch threshold (threshold) adjustment (effective when the auto squelch switch is on)

Short press the FRE knob down to enter the automatic squelch threshold adjustment interface. The user can adjust the automatic squelch action threshold according to the specific usage. The adjustment range is 0-20. The larger the value, the higher the threshold and the easier the weak signal is to be blocked. Mute. The opposite is true.

<9>: Serial port (no need to connect without serial port control)

The module reserves TTL level serial port control interface. The communication between the TTL serial port and this module needs to be connected to the UART_RX, UART_TX and GND of the module (marked on the corresponding position of the PCB). You can use an external MCU (MCU) or computer serial port to send commands to control the relevant information of the module. Function. Note: Because the level of the computer serial port is not TTL level, when connecting to the computer for communication, it is necessary to connect the RS323 level to TTL level replacement device or use the USB to TTL level serial port module to communicate with this module. Because the serial port command control module requires a certain degree of computer expertise, buyers who do not understand do not need to toss. See the baby description for all the information, and the customer service does not provide technical guidance in this regard.

<10>: User settings

This module can set the backlight status and whether to listen to the campus radio frequency band according to the specific usage of the user. The setting method is as follows. In the power-off state, press and hold down the VOL knob to turn on the power, and the LCD will display C1 to open the campus radio. C0 to close the campus radio frequency band. The settings will take effect after restarting. To set the backlight state, press and hold the FRE knob to turn on the power in the power-off state, and display B1 means the backlight is always on, B0 means the backlight is turned off for 20 seconds, and the setting will take effect after restarting. To change the setting state Repeat this step to switch. The factory is uniformly set to not open the campus broadcast frequency band, and the backlight will turn off for 20 seconds without any operation.

<11>: Stereo (stereo)/mono (mono) switch terminal

The Stereo/mono terminal is used to set the FM receiving mode of the module. This terminal is suspended for stereo receiving mode, and this terminal is connected to ground for mono receiving mode.

illustrate:

The purpose of setting the Stereo/mono switch: Due to the difference in the principles of stereo decoding and mono decoding, the decoded stereo signal occupies a wider frequency band and requires higher signal quality. Therefore, when listening to a relatively weak stereo broadcast, the signal-to-noise ratio will be very low, and more noise floor will be generated. At this time, the circuit can be changed to a monophonic receiving state to improve the signal-to-noise ratio of the output signal. Although there is no stereo effect in mono mode, the noise is relatively small, which makes the listening effect better. In other words, this switch is used to improve the signal-to-noise ratio of the radio in the case of weak signal. Switching to mono can make the sound of the radio clearer in the case of weak signal, so medium and high-end FM stereo radios are reserved for Stereo/mono switch for greater environmental adaptability.

Note: The factory default setting is to turn off campus broadcast, the backlight will automatically turn off after 20 seconds of no operation, and the automatic squelch will be turned off. Users can set it according to the specific situation.

Precautions:

- 1: The power supply voltage is strictly prohibited to exceed the power supply voltage range of this module.
- 2: Do not touch the components on the back of the module during operation, so as not to affect the normal operation of the module or cause a short circuit to burn the module.

Some basics about squelch:

The frequency discriminator is used for demodulation in most FM receivers, and the power spectrum of the frequency discriminator's output noise presents a parabolic distribution, which increases squarely with the increase of the output frequency. Therefore, when there is no input useful signal, the frequency discriminator demodulates the output noise with a large amplitude. After these noises are amplified by the audio amplifier, a large "rustle" noise is output. In order to remove these noises, a squelch circuit has to be added to the FM receiver that transmits speech. When there is no input signal or the input signal is very weak, the squelch system turns off the audio output and keeps the earphones quiet. A reliable squelch system is of great significance to FM receivers.

1. Common noise suppression methods and performance comparison

The squelch circuit system is roughly divided into three categories: pilot squelch, noise squelch, and carrier detection squelch. Before the transmitter modulates the voice signal, it usually adds a single tone at the low end of the voice signal frequency (below 300Hz), and then sends it to modulate and transmit. The receiving end detects this single tone after demodulation, and performs squelch control. Limited by the squelch output attenuation and the transmitter circuit's low frequency response, the national military standard stipulates that the pilot frequency of the FM radio station is 150 Hz (plus or minus 2 Hz).

The noise suppression method utilizes the noise pressure characteristic of the phase detector. When the radio frequency signal is strong, the output noise is reduced; when the radio frequency signal disappears, the white noise of a relatively large amplitude is output. The noise squelch method utilizes this characteristic for squelch control. The general narrow-band FM receiver is equipped with an audio amplifier (noise extraction filter) and a simple Schmitt comparator for noise squelch. Almost all civilian FM receivers use this squelch method.

The carrier detection squelch is to use the current of the limiter circuit before the frequency discriminator and the logarithm of the input signal strength to be proportional in a considerable range. Many FM receiver ICs give this input signal strength signal (RSSI). This signal is often used as output signal strength meter driver, AGC, carrier detect squelch, etc.

Among the three squelch methods, the pilot squelch circuit is the most complex, and additional transmission power is added, which has the advantages of strong anti-interference ability and simple operation; the noise squelch and carrier squelch circuit are simple, and no additional pilot frequency is required. Interoperability can be achieved; in order to increase compatibility, some radio stations often have both pilot squelch function and noise squelch function.

With the development of digital communication technology, more and more digital algorithms are applied to squelch detection. This module uses DSP devices to sample FM audio signals, and sends squelch flags to control audio processing after calculation in DSP. unit on/off.

The adjustment method of the squelch of this module:

This module adopts DSP digital squelch, which can flexibly use software to control the squelch threshold (threshold). The squelch threshold is 0-20 grades. The lower the value, the lower the squelch threshold, and the easier it is to listen to the radio signal with background noise. The higher the value, the higher the noise threshold. When the output noise is higher than the set value, it will automatically mute. Noise on, mutes the output. Therefore, when adjusting the squelch threshold, according to the situation of use, if you want to hear a weak signal, the squelch threshold is lowered, and if you want to hear a strong signal, the number is raised. Note that the squelch function cannot remove the background noise in the signal, but only controls the output mute by judging that the noise level of the signal exceeds the set threshold.

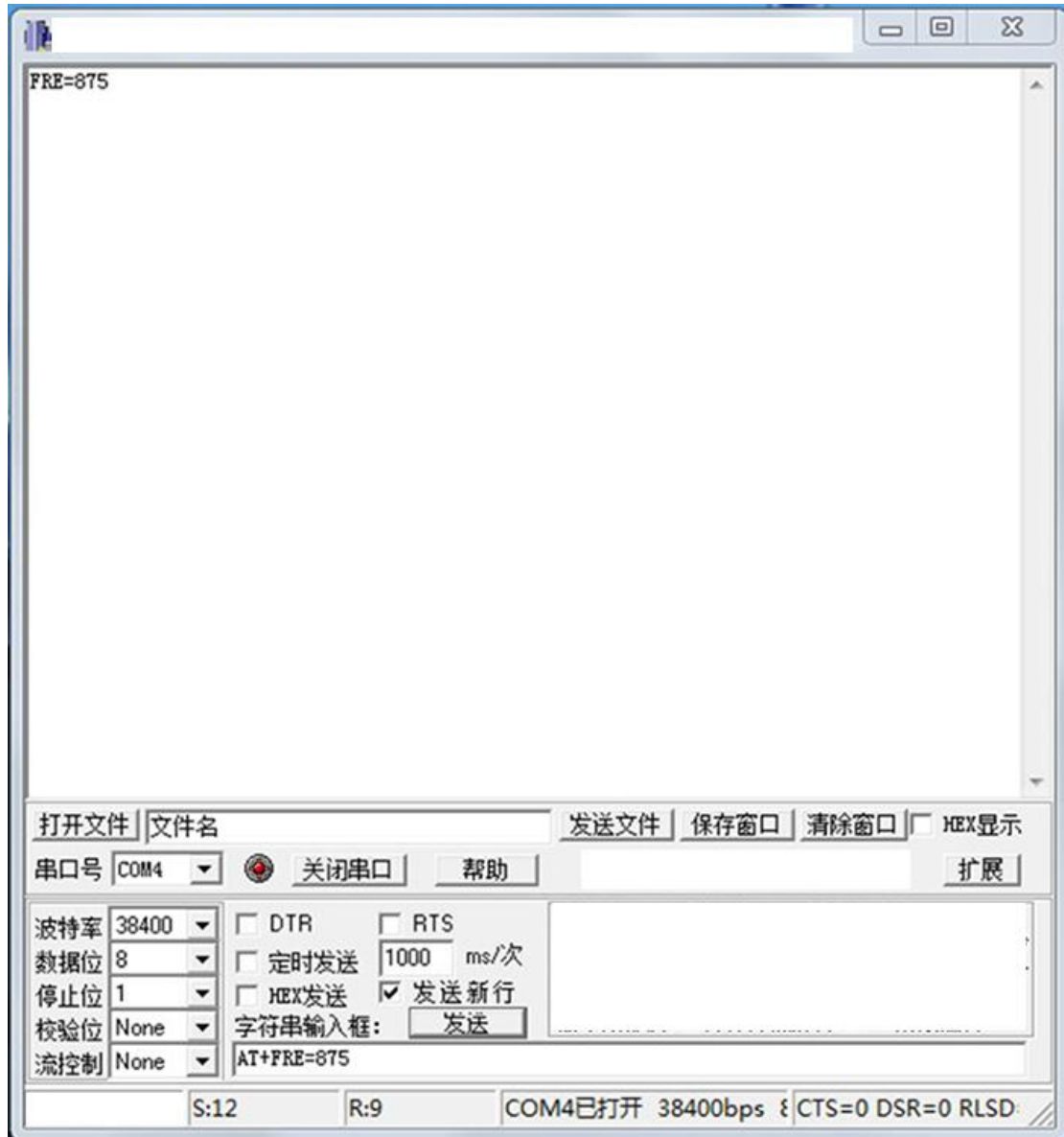
Connecting to a computer as a USB sound card in use:

The following is the information of controlling this module through the computer serial port:

(Because of certain computer expertise, buyers who do not understand do not need to pay attention to the following parts, just use the knob to operate the module.

Serial port demonstration example and configuration:

Example: PC serial assistant sends AT+FRE=875 (set the receiving frequency to 87.5MHZ), the module returns the current frequency FRE=875 as shown below:



FM with squelch receiver module AT command description

Baud rate: 38400 TTL level

Command name	Instruction example	Instruction description	Ranges	Return value
Set the current frequency	AT+FRE=875	Set the current frequency to 87.5MHZ	760-1080 (on campus radio) 870-1080 (off campus radio)	Current frequency or ERR (error)
Frequency -0.1MHZ	AT+FRED			Current frequency
Frequency point +0.1MHZ	AT+FREU			Current frequency
Pause/Resume	AT+PAUS			PLAY PAUS, ERR
set volume	AT+VOL=15	Set the current volume to 15	00-30	VOL value or ERR
volume-	AT+VOLD	volume -1		VOL value or ERR
volume+	AT+VOLU	volume +1		VOL value or ERR

Set the backlight off time (seconds) Among them, 00 is off and 01 is long on	AT+BANK=10	Set the backlight to turn off after a 10-second delay	00-99	BANK value or ERR
Switch Campus Radio	AT+CAMPUS=1	Open campus radio	0 (off)-1 (on)	CAMPUS.OFF or CAMPUS_ON
Switch DSP Squelch	AT+SN=1	Enable DSP squelch function	0 (off)-1 (on)	SN_OFF or SN_ON
Set Squelch Threshold	AT+SN_THR=10	Set the squelch threshold to 10	00-20	SN_THR value or ERR (the threshold can only be set when SN_ON)
Reset	AT+CR	Reset: 1:VOL=30 //Volume 30 2:SN_OFF // close DSP squelch 3:SNTHR =10 // restore squelch threshold to 10 4:FRE=875 // Frequency 87.5MHZ BANK=20// The backlight is off after a delay of 20s CAMPOS_OFF // Turn off campus broadcast FRE=875 //Current frequency 875MHZ		OK
Returns the current status information of the module	AT+RET			VOL=10 // volume 10 FRE=875 //Frequency 87.5MHZ PLAY/PAUS//Mute state BANK_OFF (BANK_ON) //Backlight off time (1 long on, 0 long off, or delay xs) CAMPOS_OFF (CAMPOS_ON) //Whether to open campus broadcast