1 Description of M3000 high-frequency module

M3000 high-frequency module has two versions: M3000A and M3000D, with different frequency bands. The module could transmit voice signal, modulate, amplify power, amplify noise, demodulate voice signal and process signals. It works with only external MCU, audio amplifier, MIC (microphone) and Speaker.

The module is with small volume. It is easy to develop within short period. It could be made into small interphone, and be used in other mobile devices. It is practical and easy to use, and may be widely used in gifts, catering, tourism and other industries.

2 Technical Parameter

2.1 Receiving (RX) Technical parameters:
- Receiving sensitivity: <-120dBm (12dB SINAD)
- Distortion: <3%
- SQ Squelch Sensitivity: +/-2dB
- Frequency band: 300HZ ~ 3KHZ (+/-3 dB)
- SINAD: > 40 dB
- Ratio of signal to noise (S/N): > 45 dB
- AF output level: > 120mV
- Maximum current consumption: <70mA
- Digital volume control: 8 level Max
- Operating voltage: DC3.3V - 4.5V

2.2 Transmission (TX) Technical parameters:
- Frequency: M3000A frequency (between 395MHz-470MHz)
  M3000D frequency (between 315MHz-385MHz)
- Maximum transmission power: > 450mW, power can be specified.
- Channel space: Standard narrow band12.5KHz; broad band: 25 KHz; others could be set with software by users.
- Maximum modulation frequency deviation: Narrow band <2.5KHZ; Broad band: <4.5KHZ
- Remaining frequency deviation: <60HZ
- Modulation Distortion: <2%
- Frequency Error: <5PPm
- Maximum current consumption: <400mA
- CTCSS frequency deviation: <0.6KHZ, the software may be set.
- Distance: around 4.5Km (test in flat and broad area)
### 3 Description of module pins

#### 3.1 Pin graph

![Pin Diagram](image)

Module size: 31.6mm x 17.3mm x 2.7mm

#### 3.2 Description of Pins

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT</td>
<td>Radio frequency output</td>
</tr>
<tr>
<td>GND</td>
<td>Power supply</td>
</tr>
<tr>
<td>TONEIN</td>
<td>Input channel 2 of transmitted voice (tone input and digital input)</td>
</tr>
<tr>
<td>MICIN</td>
<td>Input channel 2 of transmitted voice (mic input)</td>
</tr>
<tr>
<td>AFOUT</td>
<td>Output of receiving voice</td>
</tr>
<tr>
<td>BATT+</td>
<td>Power supply+</td>
</tr>
<tr>
<td>TXON</td>
<td>Invalid pin</td>
</tr>
<tr>
<td>CTSOUT</td>
<td>CTCSS/CDCSS output</td>
</tr>
<tr>
<td>PDN</td>
<td>Chip enable pin, valid at high level</td>
</tr>
<tr>
<td>SEN</td>
<td>Serial interface enable input</td>
</tr>
<tr>
<td>SCLK</td>
<td>Serial interface clock input</td>
</tr>
<tr>
<td>SDIO</td>
<td>Serial interface digital input</td>
</tr>
<tr>
<td>CTSIN</td>
<td>CTCSS/CDCSS input</td>
</tr>
</tbody>
</table>
4 Circuit chart of module application

GND: Connection should be normal.
CTSI#: External input CTCSS/CDCSS code, CTCSS code could be internally integrated in module chip, yet CDCSS could be only externally input.
CTSO#T: Used for external MCU decode. The pin outputs wave signal of CTCSS/CDCSS code.
Mute Control: Turn on or turn off voice amplifier.
### M3000 high-frequency module Q & A

Q1: Apart from three-line communication port, M3000 high-frequency module includes TXON and PDN pin, what is their function? How to control them when transmitting and receiving?

A1: TXON is invalid pin. TXON is originally used to control output of transmission power, and now the module power output is controlled by chip pins, so TXON pin does not work. Together with three-line communication port, PDN controls the work of M3000 high-frequency module. PDN pin is at high level when transmitting and receiving, and at low level when it is in sleep mode.

Q2: Is TXON directly connected to PTT key?

A2: TXON is invalid pin, and users do not have to consider it.

Q3: Some interphones have VOX function, human voice can control transmitting mode by replacing PTT key. As long as VOX is enabled, as long as human voice meets the requirement, it could be transmitted automatically. Does M3000 high-frequency module have VOX function?

A3: It has VOX function, and the VOX in M3000 high-frequency module may be set into 19 grades, each grade with different sensitivity. However, sensitivity setting should be treated carefully. If high sensitivity is set, external noise could enable interphone transmission. It is necessary to set low sensitivity, and speak louder than external noise.

Q4: How to enable VOX in M3000 high-frequency module? Can it work with only M3000 high-frequency module?

A4: It works with MCU and M3000 high frequency module. MCU sets a VOX enable threshold, and sends to VOX comparator in M3000 high frequency module to compares levels. Then the feedback of comparison is send back to MCU, based on which MCU decides whether to transmit.

Q5: Does VOX need to be set only in transmitting mode, is VOX necessary in receiving mode?

A5: No, VOX function should be enabled in both transmitting mode and receiving mode. Because in VOX mode, MCU detects MIC input continuously. If MIC input exceeds the setting value, MCU transmits commands. If MIC input does not reach the setting value, MCU stops transmitting. Therefore, VOX function should be set in both transmitting mode and receiving mode.

Q6: If alarm function is to be added into product, is it possible to input signal to TONEIN through external MCU, and transmit through M3000 high-frequency module, which makes receiving port ring automatically after receiving signal?

A6: Yes, TONEIN port is exclusively used for other alarm rings and data transmission.

Q7: What can control the signaling of TONEIN, does only key do it?

A7: It can be set by users. Users may choose control method freely, and key is only one of the methods.

Q8: How does M30000 high-frequency module select frequency? What should be focused on at the time of purchase?

A8: Frequency could be selected by DIP switches or menu button. The frequency of M3000 high-frequency is decided by frequency value of registers. The performance of M3000A module is almost the same within 395MHz-470MHz. The performance of M3000D is almost the same within 315MHz-385MHz. Two points should be focused on at the time of purchase: 1. there are two specifications for M3000 high-frequency...
Q9: Does M3000 high-frequency module have SQ function? Is it necessary to add a few CTCSS codes to improve squelch?
A9: M3000 high-frequency module has SQ function: M3000 high-frequency module detects noise or signal, and decides whether to enable or disable transmission according to SQ grade set by software. The number of CTCSS code is not related to squelch, as only a CTCSS code at one frequency could be transmitted at one moment. Adding more CTCSS code could improve SQ function (by choosing useful information). According to international standard, there are 38 sub-tone CTCSS codes within 67Hz-250.3Hz.

Q10: What is SO squelch? How does it work? What is the difference between SQ squelch and CTCSS squelch?
A10: SQ works by high frequency of noise and signal normal voice (about 10KHz-30KHz). When there is more useful signal, there is a less noise. When there is less useful signal, there is more noise. Chip detects useful signal by detecting noise, and then decides whether to enable receiving channel. CTCSS is the identification code for useless information which is added on purpose. The signal is not always noise, it is analog signal, just like address code.

Q11: Does M3000 high-frequency module support CDCSS? What is the difference in setting between CDCSS and CTCSS?
A11: It supports. CTCSS may be generated in MC3000 high-frequency module, and it may be generated in external MCU, and then be sent to M3000 high-frequency module through CTS_IN pin. However, CDCSS may only be generated in external MCU, and then be sent to M3000 high-frequency module through CTS_IN pin. While receiving, CTCSS signal and CDCSS signal is sent to MCU decoding from CTS_OUT. The frequency of CTCSS may be directly read by MCU in module, even without external MCU decoding.

Q12: Can MCD 3000 high-frequency module set frequency and channels? How many channels could it set?
A12: Yes, it could set. Within the frequency band specified in instruction, any frequency and the instructions could be set. For example, within 80MHz, the channel space is 12.5KHz, then there would be 80 * 1000/12.5 = 6400 channels.

Q13: Is power adjustable?
A13: Yes, 8 grades could be divided by MCU, with little change, about 100mW. If obvious power change is necessary, module circuit needs to be changed. Module with specified power could be ordered from MC Devices. Satisfactory result could be achieved with software setting.

Q14: Can function of automatic search be added?
A14: Yes, the function may be added with external MCU. Please refer to scanning method of general interphone.

Q15: Can four persons talk at the same time with duplex?
A15: Yes, yet the same frequency and the same sub-tone code are necessary. M3000 high-frequency module is interphone module. And the communication way is half duplex. Generally speaking, after one person talks,
the other talks. If they talk at the same time, nothing could be heard. If four persons talk (use) at the same time, only one person could talk. If two or more persons talk at the same time, the communication would be affected.

Q16: What is the output power of MCD3000 high-frequency module?
A16: The standard power of M3000 high-frequency module is about 0.5W, and users may specify power. The biggest is 2W. Users should be aware of heat if it exceeds 1W.

Q17: Could voice communication and data transmission (information transmitting and receiving) be supported at the same time?
A17: Yes, the data is transmitted by DCS (digital sub-tone), yet with lower speed. It is about 70bit/s, and it is not suitable for transmission of short messages.

Q18: Could digital signal be transmitted? If possible, does it affect voice signal? What is the effect?
A18: Yes. Signal with relatively higher speed may be modulated from MIC port directly, with the highest 3bit/s. And digital and voice could not be transmitted at the same time. If digital and voice signal are to be transmitted at the same time, digital signal may be input from CTS_IN port by DCS (digital sub-tone), with lower speed, about 70bit/s. And voice signal is input from MIC port.

Q19: What equipments should be added to ensure interphone function in M3000 high-frequency module?
A19: External MCU (control programming), amplifier, MIC and speaker are necessary.

Q20: What is the transmission distance of M3000 high-frequency module?
A20: It varies with specific power and environment. When the power is 0.5W, the distance becomes 3km in flat and broad area.

Q21: Which frequency band may M3000 high-frequency module work within?
A21: There are two types of M3000 high-frequency module, with two frequency bands. M3000D: 315-385MHz; M3000A: 395-470MHZ.

Q22: Is the performance of M3000A the same within 395MHz-470MHz?
A22: With voltage 4.2V, the output power of 395MHz-440MHz is between 600mW-700mW, and the sensitivity <-120dBm; the output power of 440MHz-470MHz is between 500mW-600mW, and the sensitivity <-120dBm.
The above power could be changed if users specify.

Q23: Is the performance of M3000D the same within 315MHz-385MHz?
A23: With voltage 4.2V, the output power of 315MHz-350MHz is between 500mW-600mW, and the sensitivity <-120dBm; the output power of 350MHz-385MHz is between 600mW-700mW, and the sensitivity <-120dBm.
The above power could be changed if users specify.
Important Notice

MC Devices reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to MC Devices’ terms and conditions of sale supplied at the time of order acknowledgment.

MC Devices warrants performance of its products to the specifications applicable at the time of sale in accordance with MC Devices’ standard warranty. Testing and other quality control techniques are also support this warranty.