

SHENZHEN SILICONTRA TECHNOLOGY CO.,LTD.

CC2500MPATR2. 4-V

2.4GHz RF modules

(V2.0)

Catalogue

1. Modules introduction	2
2. Parameters	4
2.1 Essential parameter	4
3. Modules description	5
4. Hardware design	7
5. Transmission issue	8
6. Modules damage inspection	8
7. High bit error rate issue	8

Revision record

Versions	Change date	Change content
V1.0	2019-4-16	Original version
V2.0	2022-8-17	1. Format optimization 2. Add antenna selection

1. Modules introduction



(Subject to physical goods)

1.1 Brief introduction

CC2500MPATR2.4-V is developed by the RF-chip CC2500. It is a truly low-cost, highly integrated 2.4GHz module designed for remote wireless applications.

We will provide complete hardware and software solutions for you to shorten the R&D cycle and save costs.

1.2 The characteristics of modules

- Frequency 2.4GHz, can be programmed 2.4-2.483GHz.
- SMD element, 31.6*16.5mm, PCB antenna/ IPEX antenna interface optional.
- Support GFSK modulation mode.
- Set power by software
- Flexible RF channel configuration, fast switching frequency point.
- Set RF baud rate by software, 1.2k~500kbps.
- 3.3V power supply.
- SPI interface, RSSI output, carrier sense indication.

1.3 Application scenario

- Wireless sensor.
- Low power telemetry.
- AMR - automatic transcription.
- RKE - two way remote keyless login .
- Remote controlled toy.
- Wireless light control.
- Wireless alarm and security system.

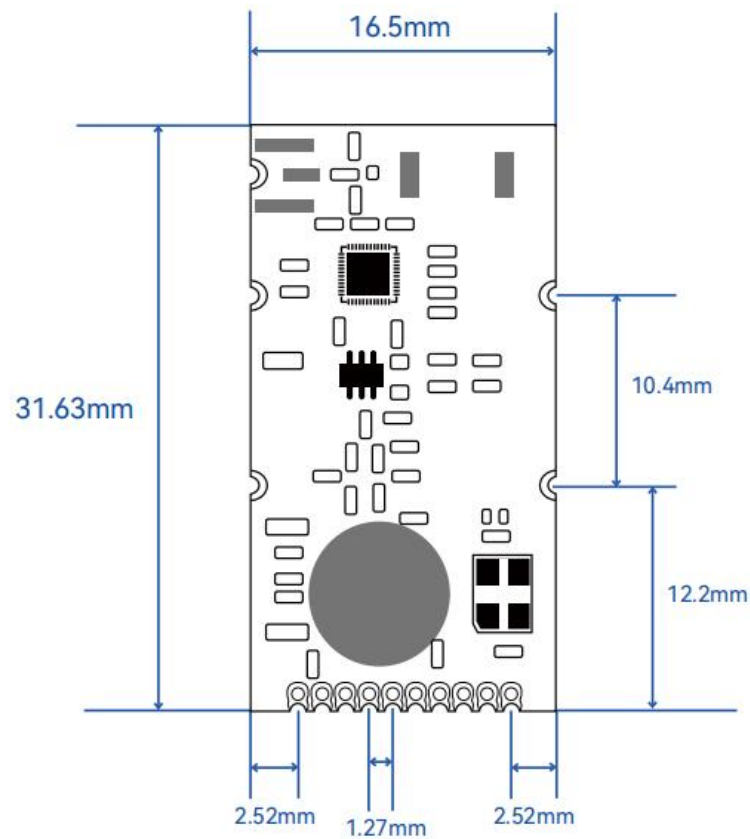
2. Parameters

2.1 Essential parameter

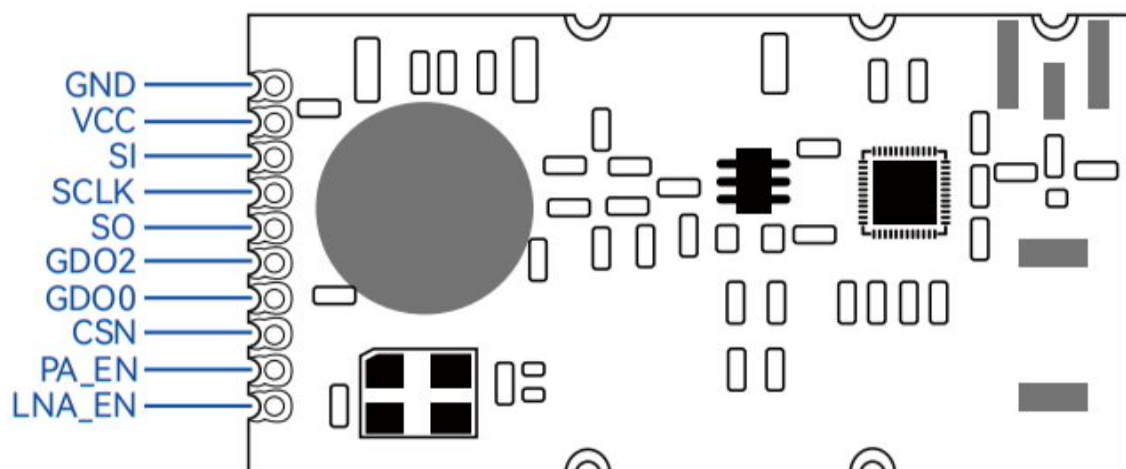
The technical parameters of CC2500MPATR		
Item	Parameters	Remark
VCC	2.4 ~ 3.6V, Rated voltage: 3.3V	
Frequency	2.400-2483.5MHz	
Modulation	GFSK	
Rx sensitivity	-122dBm	2.4kbps
TX current	<300mA	
Rx current	<20mA	
Sleep current	5uA	
RF baud rate	1.2~500kbps	
Data interface	SPI	
Antenna impedance	50Ω	
Storage temperature range	-50 ~ 150°C	
Work Temperature range	-20 ~ 70°C	
Size	31.6mm × 16.5mm	

3. Modules description

3.1 Size diagram



3.2 Pin diagram



3.3 Pin function description

Num.	Name	Description
1	GND	Ground
2	VCC	DC: 1.8-3.6V, Rated voltage: +3.3V
3	SI	Data input
4	SCLK	Clock input
5	SO	Data output
6	GDO2	Data output, configured by a register
7	GDO0	Data output, configured by a register
8	CSN	Chip selection
9	PA_EN	TX: PA_EN=1 & LNA_EN=0
10	LNA_EN	RX: PA_EN=0 & LNA_EN=1

Remark: 1, MCU can use general I/O port to implement SPI interface, If SPI is 5 V level, refer to TI AN021 file for processing. GDO0, GDO2 according to the application connection, you can select one of them as the send/receive interrupt request signal to control the MCU receive/send, or not linking-up, and through the SPI port to read the module status to receive/send.

2, If an external antenna is selected, it can be connected to the product housing with an extended cable. If the PCB antenna is selected, the part of PCB antenna should be floating as far as possible, or at least the part is not grounded. PCB antenna surrounding can not have transformers, crystals and other large metal parts to avoid affecting the distance.

3, Production can not be reflow welding, only manual welding.

4. Hardware design

Recommend to use the DCDC that the power ripple coefficient is smaller to supply the power if you can, ensure proper grounding.

Verify the power source voltage falls within the specified range and confirm correct connection of positive and negative terminal, failure to do so may result in modules breakdown due to overvoltage or incorrect connections.

The power supply stability should be checked and maintained consistently.

Avoid proximity to components with significant electromagnetic interface, such as the power supply, transformer and high-frequency cable.

The cable carrying power supply or high-frequency signals should not be routed through the bottom of the module. If there is no alternative, ensure that the module is soldered on the layer named 'Toplayer' , with grounding perimeter areas and copper, before laying the cable on the other layer named 'Bottomlayer' . The cable going through below the module, even on a different layer, may result in signal scattering and desensitization.

In case of unavoidable electromagnetic interface, ensure proper isolation and shielding by adding a shielding case.

5. Transmission issue

The transmission distance will decrease in presence of obstacles or shelter.

Changes in temperature, humidity, or frequency interface can increase packet loss rate.

Radio waves are absorbed and reflected by the ground, therefore, module performance worsens as proximity to the ground. Recommend to keep a minimum distance of 1.5m from the ground if possible.

Metal absorb radio waves, so it is important to keep antennas away from metal objects and avoid placing them inside metal boxes.

The higher RF baud rate, The closer the transmission distance.

The TX power decreases as the voltage drops below the rated level.

Ensure the antenna and modules match.

6. Modules damage inspection

Check the power supply, ensure the voltage remains within the recommended range with minimum fluctuation. Modules may become damaged if the voltage exceeds its maximum limit.

Maintain ESD protection for RF components which are electrostatic sensitive. Additionally, ensure the humidity levels remain at an appropriate level as some components are sensitive to high humidity levels.

Unless otherwise specified, it is not advisable to use this product in excessively high or low temperatures.

7. High bit error rate issue

Same frequency signal interface, remove interface or modifying the frequency (interval 500MHz at least) /RF channels.

Power supply instability, check and replace a stable one.

FCC Warning

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC Part 15 Subpart C has been investigated. It is applicable to the modular transmitter

2.3 Specific Operational Use Conditions

This module is stand-alone modular. If the end product will involve the multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited Module Procedures

Not applicable

2.5 Trace Antenna Designs

Not applicable

2.6 RF Exposure Considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

2.7 Antenna Type and Gain

The module only used dipole antenna and maximum antenna gain is 2.0dBi for 2.4G.

The following antennas have been certified for use with this module.

Only antennas of the same type with equal or lower gain may also be used with this module. Other types of antennas and/or higher gain antennas may require the additional authorization for operation.

2.8 End Product Labelling Compliance Information

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: XAO-MPATR24C" . The FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on Test Modes and Additional Testing Requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) class II permissive change reevaluation or new FCC authorization.

Host manufacturer installed this modular with single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C, 15.209, 15.207 requirement, only if the test result comply with FCC part 15C, 15.209, 15.207 requirement, then the host can be sold legally.

2.10 Additional testing, Part 15 Subpart B Disclaimer

This transmitter modular is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B rules requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rules requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this modular installed.

2.11 Manual Information to The End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user' s manual of the end product which integrates this module. The host integrator must follow the integration instructions provided in this document and ensure that the composite system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB Publication 996369.

OEM/Host Manufacturer Responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and RF Exposure essential requirements of the FCC rules.

2.12 How to Make Changes - Important Note

In the event that these conditions cannot be met (for example for mobile products or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.