

# CC2500+RFX2401C\_S\_RF7 RF Module User Manual

Product Name: CC2500+RFX2401C\_S\_RF7

Model No.: RF7



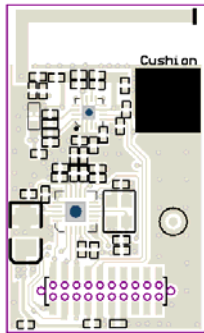
RF7 is a 2.4GHz SMD wireless module with function for receiving and transmitting. It has a small size, and high rate up to 2Mbps. The high-performance onboard antenna is included in Module, which is accurate at impedance matching. This module has been mass produced smoothly, and can be used for various applications scenarios. The CC2500 chip in RF7 module is Ti chip. Equipped with 20dBm power amplification chip of RFX2401, it's max transmitted power is up to 114dBuV (conform to FCCID and CE and ICID certification) and the receiving sensitivity can be increased by 10dB. Also, it's small size is convenient for embedded development.

## Electrical performance parameters

电气参数			
No.	Parameters name	Parameter	Note
1	RF chip	CC2500	Ti
2	AMP and LNA Chip	RFX2401	RFaxis
3	Operating frequency	2404~2480 MHz	
4	Production technology	lead-free, SMT	
5	Interface	2x10x2.54mm	SMT
6	Power supply	1.9~3.6V DC	Note: Module will be damaged permanently, if the voltage is over 3.6V
7	Communication level	0.7VCC~5V	VCC indicates supply voltage
8	Measured distance	100m+	Normal Mode(Sunny day, circumstance without interference)
9	Transmitted power	≤114dBuV	Conducted Emission Test
10	Rate	250K~2Mbps	3 level adjustable(modulated via firmware)
11	Turn-off current	1.0uA	CC2500 set to power down, CE low level
12	Emission current	35mA	
13	Receive current	20mA	
14	Communication interface	SPI	Max rate up to 10Mbps
15	Emission Length	Single Data Packet 1~32 Bytes	3 level FIFO
16	Receive Length	Single Data Packet 1~32 Bytes	3level FIFO
17	RSSI supported	Nonsupport	Support simple packet loss only
18	Antenna	2.8 dBi PCB Antenna	
19	Operating	-10℃~+40℃	

	Temperature		
20	Operating humidity	35% ~ 95% RH	
21	Storage temperature	-40°C ~ +125°C	
22	Receive sensitivity	-95dBm	1000kbps 0.1% BER
23			More details please refer to chip manual.

Interface



PCB Specification:  
21.4x35.5x1.0mm

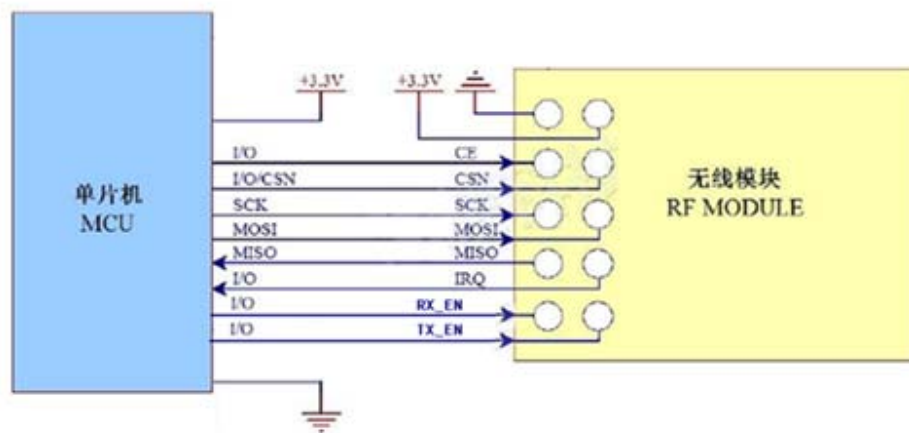
Pin	Name	Pin Direction	Use
1	RF_SCK	Input	Module SPI Bus Clock
2	RF_CSN	Input	Module CS PIN
3	RF_CE	Input	Module control PIN
4	V_NRF		Power supply should be between 1.9-3.6V
5	GND		Ground, connect to Power ground referenced
6	GND		Ground, connect to Power ground referenced
7	GND		Ground, connect to Power ground referenced
8	N/A		Not Connected
9	N/A		Not Connected
10	N/A		Not Connected
11	N/A		Not Connected
12	N/A		Not Connected
13	N/A		Not Connected
14	N/A		Not Connected
15	N/A		Not Connected

16	RX_EN		LNA enable feet, high level effective
17	TX_EN		PA enable feet, high level effective
18	RF_IRQ	Output	Module interrupt signal output, low level effective
19	RF_MISO	Output	Module SPI data output PIN
20	RF_MOSI	Input	Module SPI data input PIN
*Please refer to Ti authority 《CC2500 Datasheet》 for PIN definition of module, software driver and communication protocol.			

## Notice

No	Category	Notice
1	Static	High frequency analog device Avoid touching components on module if possible, since the high frequency analog device features electrostatic susceptibility
2	Soldering	Electric soldering iron must be well connected to ground when soldering
3	Power supply	Power supply quality influence on module performance, please insure the power supply will not appear big ripple to avoid dither in power supply.
4	Ground	Module ground apply single point grounding. It's recommended to use ohm inductance or 10mH inductance and set it apart from reference ground of other circuit in other part.
5	Antenna	Mounting structure of module antenna influence module performance. Please insure little noise interference around antenna. Note: Antenna must not mount in metallic shell, otherwise the transmission distance be weakened greatly.
6	Interference	If there are different frequency modules inside one product, the frequency should be well programmed to reduce the influence of harmonic interference and intermediation interference
7	Oscillator	If there is oscillator close to the PCB in which module mount, please increase the distance between oscillator and PCB if possible.

## Typical Circuit



CC2500+RFX2401C\_S\_RF7 RF MODULE AND MCU Connection Schematic

Note:

1. IRQ is a Interrupt Pin, which can be used to activate SCM to achieve quick response. IRQ could be unconnected to obtain interruption status by SPI (It' not recommended because of the low efficiency. And it will influence Power Consumption.)
2. CE can be connect to high voltage level for a long term, in this way write register must be set to POWER DOWN mode first.
3. Truth-value table for relationship between TX\_EN and RX\_EN as shown:

	Maximum	Minimum
H	4.5V	1.2V
L	0.3V	

TX_EN	RX_EN	MODE
H	L	TX
L	H	RX
H	H	TX
L	L	SHUT-DOWN

无线电通信模块

## Driver Statement

1. IC CC2500+RFX2401 is adopted in this module, it's driving means is same as CC2500, user can operate RF7 in accordance with manual for chip CC2500.
2. Connect LNA EN to MCU, LNA=1(Opened), LNA=0(Closed)
3. If user want to achieve auto-answer, LNA should be in high level during transmit process, to ensure interface circuit be in working state.

## FAQ:

★ Communication distance is close which did not achieve specified value.		
1	Obstacle	With physical characteristics of poor penetrability for 2.4GHz frequency , communication distance loss will be increased when these is line communication failed.
2	interference source	Interference from temperature, humidity and co-frequency will increase packet loss rate.
3	Metal	Place antenna inside metal shell or there is metal nearby the antenna will cause signal attenuation.
4	RX_EN PIN	RX_EN PIN in emitting devices didn't keep high level will reduce the reception sensitivity for responding signal.
5	Parameter values	The power register is set incorrectly and the air rate is set too high.
6	Low voltage	When voltage is under 3.3V, the lower voltage, the less transmission power.
★ Heat of module, module will be damaged easily.		
1	Supply voltage	Check power supply and ensure it's between 2.0V~3.6V. Module will be damaged permanently, if the voltage is over 3.6V
2	Stability	Please check power supply stability, voltage can't wave frequently.
3	Anti-static	Please insure antistatic handle has been applied in mounting process, especially LNA is a easy damaged part.
4	5v IEVEL	Communication line must be in series with 1k-1.5k resistance if use 5V electrical level.

## Appendix: Channel List

This module will be used on different devices, and the corresponding Channel list will are difference, Mainly, it has below channels:

CH1: 2.404000212 GHZ  
 CH2: 2.412000636 GHZ  
 CH3: 2.417000901 GHZ  
 CH4: 2.422001166 GHZ  
 CH5: 2.427001431 GHZ  
 CH6: 2.447002491 GHZ  
 CH7: 2.454002862 GHZ  
 CH8: 2.479337538 GHZ

Others channel(MHZ):

2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420  
 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437  
 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454  
 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471  
 2472 2473 2474 2475 2476 2477 2478 2479 2480

### **FCC Modular Usage Statement**

**Note 1:** This module certified complies with RF exposure requirements under mobile or fixed condition; this module is to be installed only in mobile or fixed applications

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

A fixed device is defined as a device is physically secured at one location and is not able to be easily moved to another location.

**Note 2:** Host product manufacturers must provide in their user manual the required RF exposure information for mobile & fixed usage of this module. Host product manufacturers must use the following RF exposure statement in their user manual "This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and all persons. This transmitter must not be co-location or operating in conjunction with any other antenna or transmitter."

**Note 3:** Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user shall have no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

**Note 4:** Additional testing and certification may be necessary when multiple modules are used.

**Note 5:** The module may be operated only with the integral antenna with which it is authorized.

**Note 6:** To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier's Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that after the module is installed and operational the host continues to be compliant with the part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, the manufacturer shall provide guidance to the host manufacturer for compliance with the part 15B requirements.

**Note 7:** The FCC ID label on the final system must be labeled with "Contains FCC ID: 2AEJW-RF7" or "Contains transmitter module FCC ID: 2AEJW-RF7".

**Note 8:** The FCC rule/s for this module are CFR 47 Part 15 Subpart C.

**Note 9:** This modular transmitter is only FCC authorized for the specific rule parts listed on its grant. The host product manufacturer is responsible to any other FCC rules that apply to the host not covered by the modular.

transmitter grant of certification. The final host product will require Part 15 Subpart B compliance when the modular transmitter is installed.

### **ISED Statements**

This device complies with Innovation, Science and Economic Development Canada's license-exempt RSS standard(s). Operation is subject to the following two conditions:

- 1) this device may not cause interference, and
- 2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement Économique Canada applicables aux appareils radioexempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- 1) l'appareil ne doit pas produire de brouillage, et
- 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Innovation, Science and Economic Development Canada's regulations, this radio transmitter may only operate using the integral antenna under which it was approved.

Conformément à la réglementation d'Innovation, Sciences et Développement Économique Canada, le présent émetteur radio peut fonctionner avec une antenne fonctionner qu'en utilisant l'antenne intégrée sous laquelle il a été approuvé.

### **ISED RF Exposure Statement**

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le rayonnement de la classe b respecte ISED fixaient un environnement non contrôlés. Installation et mise en œuvre de ce matériel devrait avec échangeur distance minimale entre 20 cm ton corps. Lanceurs ou nepeuvent pas coexister cette antenne ou capteurs avec d'autres.

### **ISED Modular Usage Statement**

**NOTE 1:** When the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use the wording "Contains transmitter module IC: 25192-RF7" or "Contains IC: 25192-RF7".

**NOTE 1:** Lorsque le numéro de certification ISED n'est pas visible lorsque le module est installé dans un autre appareil, l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut être

libellée Contient le module émetteur IC: 25192-RF7 ou Contient IC: 25192-RF7.



#### 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.