Operating Instructions

Transmitter module

Model No. TX0400P10

Read me first:

Thank you for purchasing the ARCT TX0400P10 TX module.

These operating instructions describe the instructions for the TX0400P10 TX module.

Before connecting, operating this product, please read these instructions completely, and save this manual for future use.

Model: TX0400P10

FCC ID: 2ADKH-TXM1U10

Here by, we declare that this TX0400P10 Module is in compliance with Part 90 of the FCC Rules and essential requirements and other relevant provisions of directive 1999/5/EC. 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.

Warranty Policy:

The warranty period and what is covered are according to applications, contracts or distributors. Please ask our sales representative.

Note:
The following damages are not covered by the warranty.
-Any secondary damages, including without limitation, business chances.
-Any damages by user including dropping, water contact or any other wrong use, other than the purpose designed for.

General Description

TX0400P10 is based on RF Transceiver CC1175 of TI Chipcon, it's a small size and ultra low power UHF wireless module. The CC1175 device is a fully integrated single-chip radio transmitter designed for high performance at very low-power and low-voltage operation in cost-effective wireless systems. All filters are integrated, thus removing the need for costly external SAW and IF filters. The device is mainly intended for the ISM (Industrial, Scientific, and Medical) and SRD (Short Range Device) frequency bands at 420–470 MHz. The MAX RF output power can be set as high as +14dBm, with data rate as high as 200Kbps. The module integrated many RF functions and PA to make the maximum output power up to +30dBm. Customer can use it conveniently and reducing your development time.

Features

- Central frequency is 450MHz, Frequency bands :420~470MHz
- Programmable output power up to +30dBm for all supported frequencies，the communication distance is above 1200m in sight .
- Programmable baseband modulator with GFSK/2-FSK/ASK/OOK/MSK
- Programmable data rate 0.6～200Kbps
- 128-byte TX data FIFO
- Optional Forward Error Correction with Interleaving
- Transmit mode at +30dBm output power <950mA
- Low current consumption at power down state <2uA
- Integrated analog temperature sensor
- Efficient SPI interface, All registers can be programmed with one "burst" transfer
- Small dimension: 50.0mm×30.0mm×2.4 mm
- Operating supply voltage: 3.0～3.6V DC, PA supply voltage: 3.0～3.6V DC

Applications

- One-way Narrowband Ultra-Low Power Wireless Systems With Channel Spacing Down to 6.25 kHz
- Wireless Metering and Wireless Smart Grid (AMR and AMI)
- IEEE 802.15.4g Systems
- Home and Building Automation
- Wireless Alarm and Security Systems
- Industrial Monitoring and Control
- Wireless Healthcare Applications
- Wireless Sensor Networks and Active RFID.
- Logistics Tracking System, Warehouse patrol, Electronic label.

General Characteristics

Test operating conditions：Ta=25°C，VCC=3.3V if nothing else stated.

Parameter	Type	Condition/Note
Operating supply voltage	DC 3.0～3.6V	
Central frequency	450MHz	Can be programmable to other frequency in bands 450~470MHz
Frequency accuracy	±1KHz	
Modulation	GFSK/2-FSK/ASK/OOK/MSK	Programmable
Transmit power	-30～+10dBm	CC1175 output power programmable
TX current consumption	<1000mA	Po= 30dBm
Sleep State current consumption	<2uA	Refer to IC operation states
Data rate	0.6～200Kbps	Programmable
Spurious emissions and harmonics	< -30dBm	TX power +30dBm
Communication distance	>1200m	1.2kBaud data rata, CC1175 = +10dBm output power
Antenna impedance	50ohm	
Operating temperature	-20～+60 °C	
Storage temperature range	50～+125°C	
Dimension		

Note：

1. The module transmission data rate will affect Transmission distance , the higher the data rate , the closer the distance, and the lower the receiving sensitivity.
2. The supply voltage to the module will affect TX power, in the operating supply voltage range, the lower the voltage to get the lower the TX power.
3. The antenna will strongly affect the communication distance, please select matched antenna and connect it correctly.
4. The module mount will affect the communication distance.

PCB Description
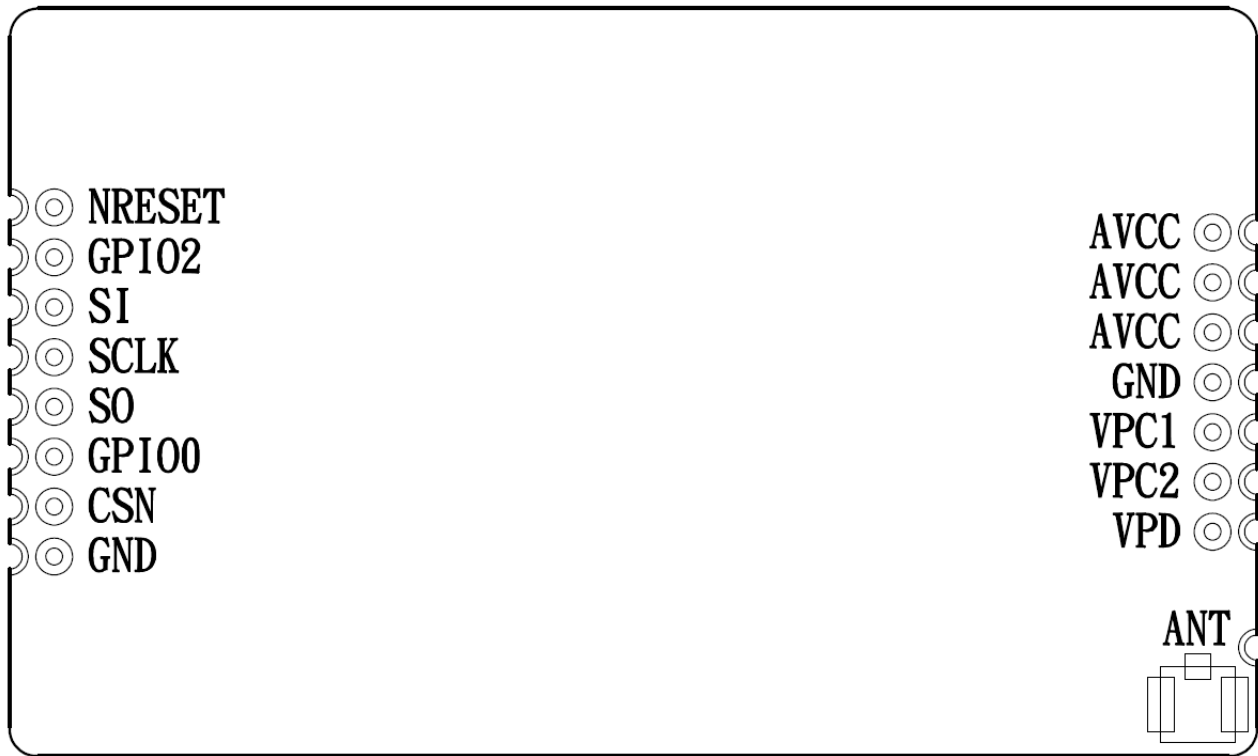
Pin Configuration

| Pin	Pin type	Description
AVCC	Power(Analog)	3~3.6V analog power supply connection
AVCC	Power(Analog)	3~3.6V analog power supply connection
AVCC	Power(Analog)	3~3.6V analog power supply connection
GND	Ground	Connect to the system ground
VPC1	Digital Input	RF power control I/O
VPC2	Digital Input	VPC1 & VPC2 = 0, RF=+30dBm ; VPC1 =1 & VPC2 =0 RF = -20dBm
ANT	RF Oupt	RF output signal from PA, connect to the Antenna
NRESET	Digital Input	Asynchronous, active-low digital reset
GPIO2	Digital I/O	General-purpose I/O
SI	Digital Input	Serial data in
SCLK	Digital Input	Serial data clock
SO	Digital Input	Serial data out
GPIO0	Digital I/O	General-purpose I/O
CSN	Digital Input	Active-low chip select
GND	Ground	Connect to the system ground

Circuit Interface
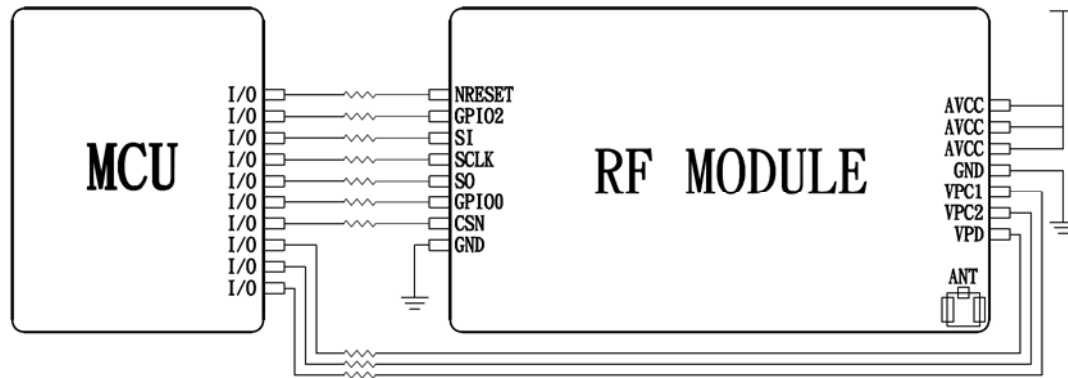
Note:
1. The module power supply voltage range is DC 3.0～3.6V, above DC 3.6V, the module will damage. It is recommended work at DC 3.3 V, the PA supply voltage consider the application condition.
2. The module interface use half circle pad to soldering on the system PCB board, the GND must soldering to the system digital GND reliably, or use connector to connect main-board .
3. The antenna must the get to the module's ANT pin as close as possible.
4. The MCU which don't have integrated SPI interface can also control the module, use the normal I/O port to work like SPI timing to read and write. The SPI data rate is below 10MHz.
5. The interface can connect directly to the MCU which use 3.3V power supply, there is no need serial resistor. If the I/O is open-drain, the pull-up resistor will be added. When connect to the MCU which use 5V power supply, the MCU's I/O output current beyond 10 mA, a 2~5k ohm resistor will be series to divide the voltage, or it will damage the module.
6. The module's pin GDO0 and GDO2 are general digital I/O ports, they can be programmable to produce trigger signal or clock output.
7. The PA control signal (VPC1, VPC2) have an effect on the communicate distance and power consumption. In transmit mode, set VPC1=0 and VPC2=0.
8. In the multiple channel application, the channel spacing is recommended to set as 1MHz, or there will be a same frequency interference.

Operation States

CC1175's operation states contain: Sleep State, Idle State, Active State，Sleep State is the lowest power mode. After wake up from Sleep State, the module get into Idle State. Except the Sleep State, each state can be switch by SPI interface, also programmed to auto-switch. CC1175's radio control state diagram is shown as below, for detail information in the CC1175 datasheet.
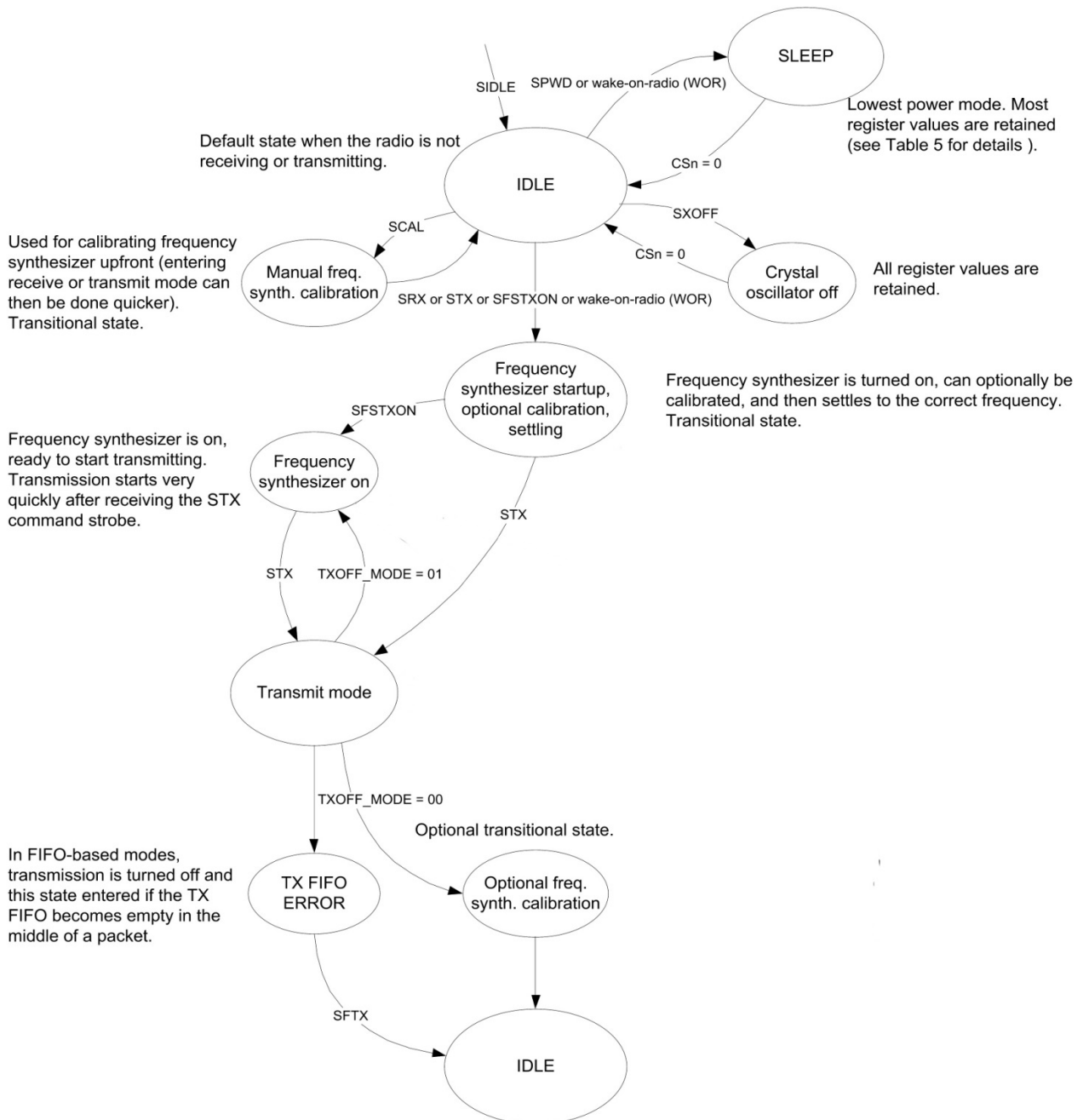
Data Transmission

The CC1175 contains a 128 byte FIFO for data to be transmitted, built-in hardware support for packet oriented radio protocols, e.g. Preamble bytes, Synchronization Word, Whitening the data, CRC checksum, Interleave and Forward Error Code, Address checksum. The SPI interface is used for sending commend control and writing to the TX FIFO.

The format of the data packet can be configured and consists of the following figure：
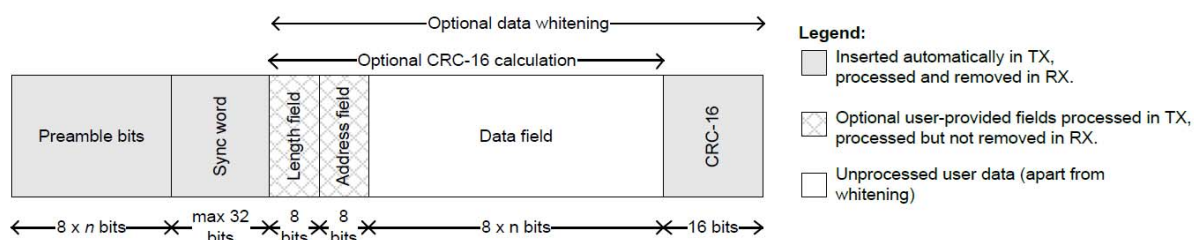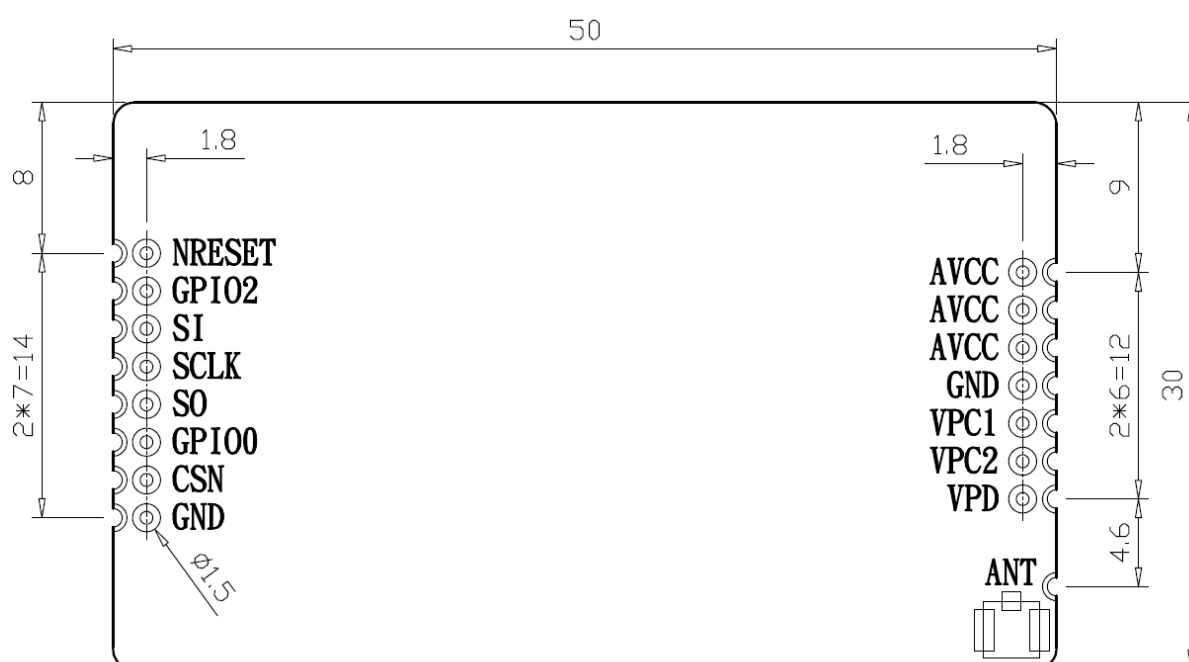

In addition, CC1175 supports fixed packet length protocols, variable packet length protocols and infinite packet length. Details refer to the CC1175 datasheet.

Configuration Registers

The configuration of CC1175 can be done with software SmartRF Studio7. Complete descriptions of the registers are given in the CC1175 datasheet. We can provide evaluation board and demo code to the customer to develop and evaluate the module's capability.

Demension

Questions and Answers

Description	Reason and Solution
Can't communication	1. The power supply is not connected well, check the module VCC whether it is out of maximum rating. 2. The signal line is not connected well, check the module SPI interface. 3. The settings of the transmitter module and receiver module are not the same. Check these modules' register configuration. 4. Signal block. If the transmitter work with a high TX power, and the receiver was put at a short distance(<0.5m), maybe there is a signal block to make no communication.
Communication distance is too short	1. The application environment is too bad or the antenna is shield. Put the antenna to a better place outside or higher throw a coaxial line, replace it with a higher gain antenna. 2. The work space contains a same frequency interference source, or a strong magnetic field interference, power source disturbance. Try to change the carrier frequency or get far away from the source of the disturbance. 3. The power supply is not strong. Check the voltage and the current whether it is enough.
High data error	1. The power supply ripple is too big, Change the power supply. 2. Check the module register configuration, it is recommended to set as the CC1175-datasheet. 3. There is a carrier frequency interference, change the channel. 4. The antenna unmatched to the module RF interface, change another matched antenna.

Development Package:

1. CC1175 datasheet（CC1175.pdf）
2. CC1175 register configuration tool（SmartRF Studio 7 v1.4.9.zip）
3. CC1175 demo code (CC1175 Demo Code.rar）
4. Hard ware tools（TI Chipcon Evaluation Board）

Note：
1. You can get the development package above from the salesman when you order the module.
2. As version update，please refer to our latest development materials.

IMPORTANT NOTICE

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ARCT warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with ARCT's standard warranty.

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Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 90 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 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.

FCC Caution: To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example - use only shielded interface cables when connecting to computer or peripheral devices).

End Product Labeling

This transmitter module is authorized only for use in devices where the antenna may be installed such that 0.65 m may be maintained between the antenna and users. The final end product must be labeled in visible area with the following: "Contains FCC ID: 2ADKH-TXM1U10"
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End Product Manual Information

The user manual for end users must include the following information in a prominent location "IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 0.65 m from all persons and must not be colocated or operating in conjunction with any other antenna or transmitter."   This device complies with part 90 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.

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final

product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.　　This device is intended only for OEM integrators under the following conditions: The antenna must be installed such that 0.65 m is maintained between the antenna and users. As long as a condition above is 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 module installed　(for example, digital device emissions, PC peripheral requirements, etc.).