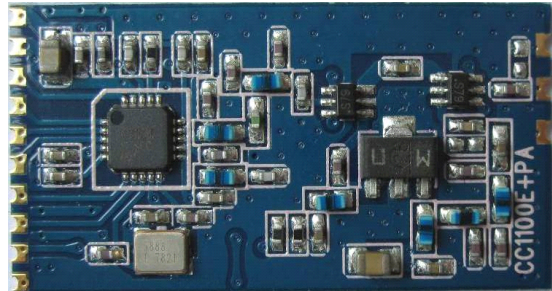# VT-CC1100EPA-950M Wireless Module User Guide

![V-CHIP logo] V-CHIP MICROSYSTEMS Co. Ltd

Address: Room 612-613, Science and Technology Service Center Building,
NO.1, Qilin Road, Nanshan District, Shenzhen, Guangdong
TEL：0755-88844812
FAX：0755-22643680
E-mail：sales@digirf.com
Post Code：518052
Web Site：www.digiRF.com

General Description

VT-CC1100EPA-950M is based on RF Transceiver CC1100E of TI Chipcon，it's a small size and ultra low power UHF wireless module. CC1100E is a low cost true single chip UHF transmitter designed for very low power wireless applications. The circuit is mainly intended for the ISM (Industrial, Scientific and Medical) and SRD (Short Range Device) frequency bands at 470 and 950MHz with data rate as high as 500Kbps. The module integrated many RF functions and PA to make the maximum output power up to +22dBm. Customer can use it conveniently and reducing your development time.

Features

- Central frequency is 950~960MHz wireless transceiver, 470~510MHz are customized.

- Programmable baseband modulator with GFSK/2-FSK/ASK/OOK/MSK

- Programmable data rate 1.2～500Kbps

- Programmable output power up to +20dBm for all supported frequencies，the communication distance is above 800m in sight

- Forward Error Correction (FEC) with interleaving and high receiver sensitivity

- Point to point, point to multipoint communication

- Low power consumption, especially when use chip coil inductors, the current consumption is only 70mA at 18dBm output power.

- Programmable Carrier Sense (CS) indicator and digital RSSI output

- Small dimension: 32.0mm×17.0mm×2.4 mm

- High performance RF system when work with MCU

- SPI interface
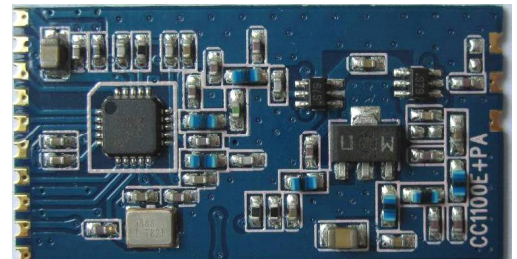
Applications

- Ultra low-power wireless applications operating in the 470/950 MHz ISM/SRD bands Logistics Tracking System

- Wireless sensor networks

- Home and building automation

- Advanced Metering Infrastructure (AMI)

- Wireless metering

- Wireless alarm and security systems

3.3V	
GND	GND
SI	
SCLK	ANT
SO	GND
GDO2	
GDO0	
CSN	
TE	
RE	

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	950MHz	Can be programmable to other frequency in bands 950~960MHz
Frequency accuracy	±10KHz	
Modulation format	GFSK/2-FSK/ASK/OOK/MSK	Programmable
Transmit power	-17～+22dBm	Programmable
TX current consumption	60~130mA	Relative with TX power
Receiver sensitivity	-112dBm	1.2Kbps
RX current consumption	<20mA	
Sleep State current consumption	<2uA	Refer to IC operation states
Data rate	1.2～500Kbps	Programmable
Communication distance	800m	2.4Kbps data rata in sight
Antenna impedance	50ohm	
Operating temperature	-20～+75 °C	
Storage temperature range	-50～+125°C	
Dimension	32.0 mm×17.0 mm×2.4mm	

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, the lower the TX power.
3． The module central frequency will change as the operating temperature change, use it under suggest temperature, the module can work well.
4． The antenna will strongly affect the communication distance, please select matched antenna and connect it correctly.
5． The module mount will affect the communication distance.

PCB Description

```
┌────────────────────────────────────────────┐
│  ▭ 3.3V                                      │
│  ▭ GND                             GND ▭     │
│  ▭ SI                                        │
│  ▭ SCLK                            ANT ▭     │
│  ▭ SO                                        │
│  ▭ GDO2                            GND ▭     │
│  ▭ GDO0                                      │
│  ▭ CSN                                       │
│  ▭ TE                                        │
│  ▭ RE                                        │
└────────────────────────────────────────────┘
```

Pin Configuration

引脚名	类型	描述
3.3V	Power	直流 1.8-3.6V 输入
GND	Ground	
SI	Digital input	数据输入（SPI）
SCLK	Digital input	时钟输入（SPI）
SO	Digital output	数据输出（SPI）
GDO2	Digital output	数据输出，由寄存器配置
GDO0	Digital output	数据输出，由寄存器配置
CSN	Digital input	模块选择（SPI）
ANT	RF I/O	Impedance 50ohm
TE	Digital input	Transmit in high, receive in low
RE	Digital input	Transmit in low, receive in high

Circuit Interface
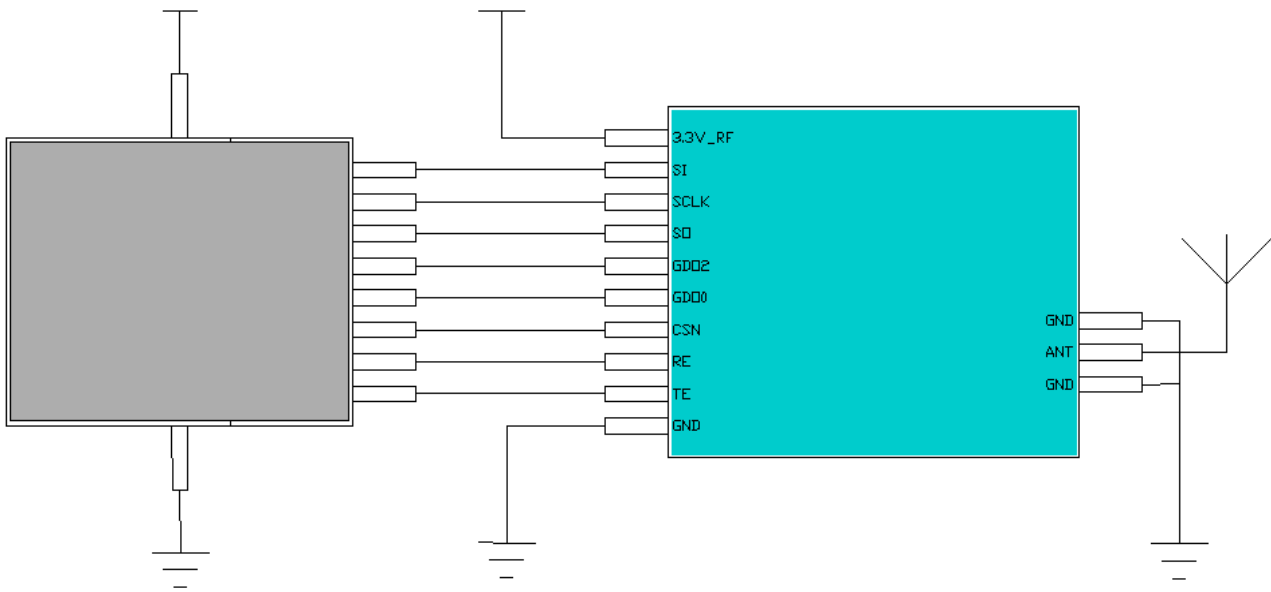
Note：

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.

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.

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 is a general digital I/O port, it can be programmable to produce trigger signal or clock output.

7．The PA control voltage have an effect on the communicate distance and power consumption. In transmit mode, set TE=0 and RE=1; in receive or sleep mode, set TE=1 and RE=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

CC1100E'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. CC1100E's radio control state diagram is shown as below, for detail information in the CC1100E datasheet.

Data Transmission

The CC1100E contains a 64 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：
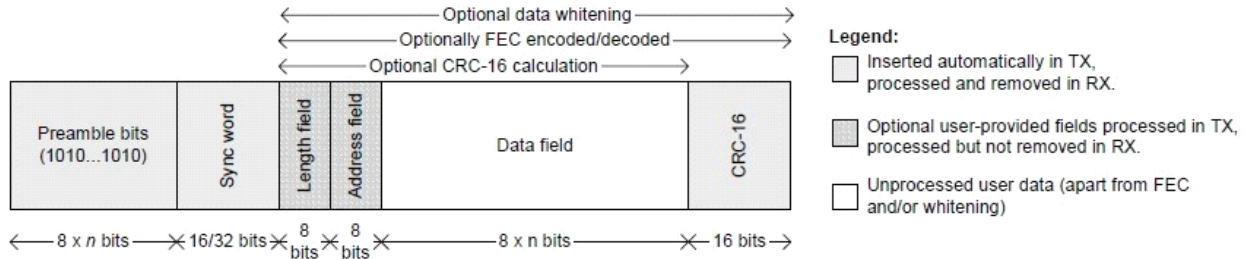

In addition, CC1100E supports fixed packet length protocols, variable packet length protocols and infinite packet length. Details refer to the CC1100E datasheet.

Configuration Registers

The configuration of CC1100E can be done with software SmartRF Studio7. Complete descriptions of the registers are given in the CC1100E datasheet. We can provide evaluation board and demo code to the customer to develop and evaluate the module's capability.

Dimension
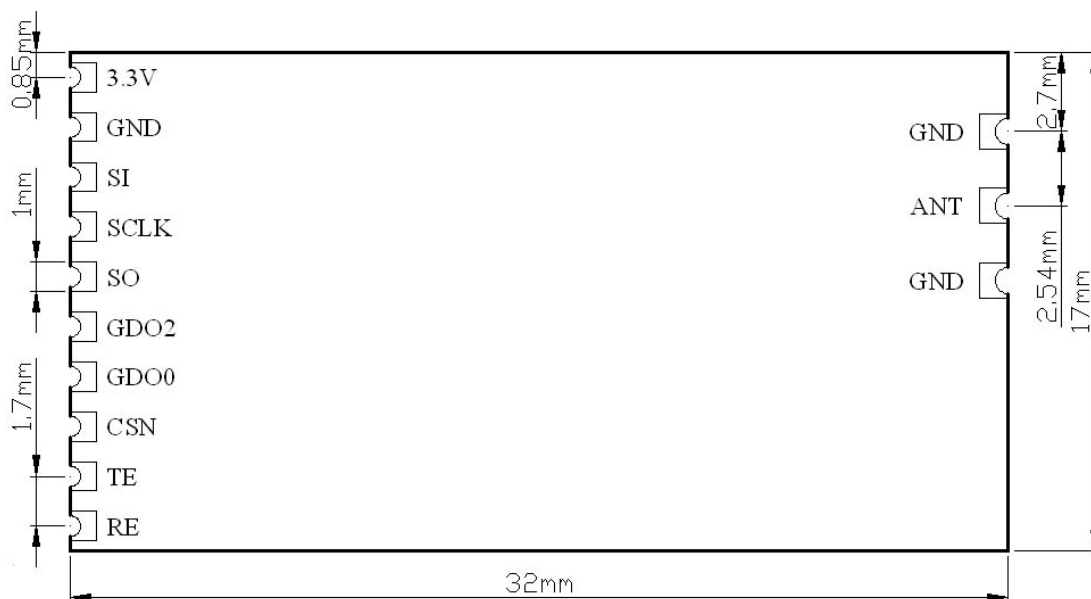
Antenna

We can provide antenna match to the module. And if there is some special requirements to satisfy, we can coordinate with you to select antenna, match antenna to the module in order to make the product work well.

Some recommend antennas as the table below.

Spring antenna（Standard） Characteristic: small size, low cost, embedded conveniently.	
SMA rubber antenna（Optional） Characteristic: medium-scale, low cost, high gain	
Magnetic Mount Antenna（Optional） Characteristic: high gain, Magnetic Mount，suitable for mount on iron box.	

Note: Standard is for free, optional need another payment and the cost refer to the antenna price.

Questions and Answers

Description	Reason and Solution
Can't communication	1．The power supply connect not well, check the module VCC whether it is out of maximum rating. 2．The signal line connect not 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 PA control voltage is not correct, check whether if it is TE=0, RE=1 in transmit mode; and TE=1, RE=0 in receive mode. 4．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 CC1100E-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. CC1100E datasheet（CC1100E.pdf）

2. CC1100E register configuration tool（SmartRF Studio 7 v1.4.9.zip）

3. CC1100E demo code (CC1100E 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.**

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