APC802
27dBm ISM RF Transceiver Module   V3.2

Features

- GFSK transceiver Module
- 433Mhz ISM frequency band
- 9.6k bps data rate
- Multiple channels
- 27dBm Max. output power
- Baud rate configurable
- 256 bytes data buffers
- Standby current < 5uA
- Supply voltage 4.7~8V

Application

- Home automation
- Security alarm
- Telemetry
- Automatic meter reading
- Contact less access
- Wireless data logger
- Remote motor control
- Wireless sensor network

DESCRIPTION

APC802 is a low-cost sub-1 GHz transceiver module designed for operations in the unlicensed ISM (Industrial Scientific Medical) and LPRD bands. GFSK (Frequency Shift Keying) modulation/demodulation, multi-channel operation, high bandwidth efficiency and anti-blocking performance make APC802 modules easy to realize the robust and reliable wireless link.

The module can be configured to work in different channels with 200k Hz space. It adopts high efficient looped interleaving EDAC (Error Detection and correction) coding with coding gain up to 3dB which keeps in advance in EDAC and coding efficiency over normal FEC (Forward Error Correction). Because of its high reliability in correction, modules can filter error and fake information automatically and realize truly transparent wireless link, which makes APC802 very suitable in the rigid communication environment.

APC802 integrates 256 bytes buffer. When the buffer is empty, users can transfer 256 bytes data per time and even limitless data transfer can be achieved as long as RF data rate (RF module to RF module) is configured to be faster than UART data rate (MCU to RF module). The module provides standard UART/TTL interface for selection. Users can choose seven data rates and three parity checks which make APC802 possibly tailor-made for different applications.

PIN FUNCTIONS

PIN	Name	Function	Description
1	GND	Ground	Ground (0V)
2	VCC	Power	Power supply
3	EN	Input	Enable pin (>1.6V);
4	RXD	Input	UART input, TTL level
5	TXD	Output	UART output, TTL level
6	B/RX	Input	RS485- or RS232 RX
7	A/TX	Output	RS485+ or RS232 TX
8	SET	Input	Parameter setting pin; Low: effective
9	NC	---	No connection

Table 1 APC802 Pin functions

ELECTRICAL SPECIFICATIONS

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
VCC	Supply Voltage	4.7		8	V
Temp	Operating temperature range	-30	25	85	°C
RH	Operating relative humidity	10		90	%
Freq	Frequency range	418		455	MHz
F_{DEV}	Modulation deviation		28.8		KHz
Mod	Modulation type		GFSK		
I_{DD}	Receive mode			35	mA
	Transmit mode @ 27dBm			400	mA
	Sleep mode			5	uA
Pout	Output power			27	dBm
Sen.	Receiving sensitivity @9.6K bps		-117		dBm
DR_{FSK}	GFSK data rate	2.4		19.2	Kbps
DR_{IN}	Interface data rate	1.2		57.6	Kbps
Ts	Switching time		5		us
CH_{BW}	Channel spacing		200		kHz
V_{IH}	Logic "1" input voltage	0.7*VCC		VCC	V
V_{IL}	Logic "0" input voltage	0		0.3*VCC	V
V_{OH}	Logic "1" output voltage	0.7*Vcc		Vcc	V
V_{OL}	Logic "0" output voltage	0		0.3*Vcc	V
I_H	Logic "1" input current (V_I = VDD)			20	uA
I_L	Logic "0" input current (V_I = VSS)			-20	uA
Z_{ANT}	Antenna Impedance		50		

Table 2 APC802 Electrical Specifications

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min.	Max.	Units
Vcc	Supply Voltage	-0.3	8	V
V_I	Input voltage	-0.3	Vcc+0.3	V
V_O	Output voltage	-0.3	Vcc+0.3	V
T_{ST}	Storage temperature	-55	125	°C

Table 3 APC802 Maximum Ratings

Setting Parameters

1. Default Values

Parameter	Option	Default Value	Unit
MCU data rate	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6	9.6	Kbps
Parity Check	No check, Even, Odd	No check	
Frequency	418MHz ~ 455MHz (1KHz per step)	434	MHz
GFSK data rate	2.4, 4.8, 9.6, 19.2	9.6	Kbps
Output Power	0 ~ 9 levels	9 (27dBm)	

Table 4 APC802 Default Settings

2. Parameter Setting

Users can configure the parameters (frequency, data rate, output power, etc.) of RF modules by PC or MCU.

♦ **BY PC.** The interface of APC802 is UART/TTL. If connecting it to PC, users need to use a TTL-to-RS232 level converter to transform the different levels. Dorji Applied Technologies also provides converter board for configuration.

Firstly users need to connect converter board to PC by cable and open APPCON RF software; then insert module into converter board. After that the status column of tool should display "Found Device". Users then can read/write the module.
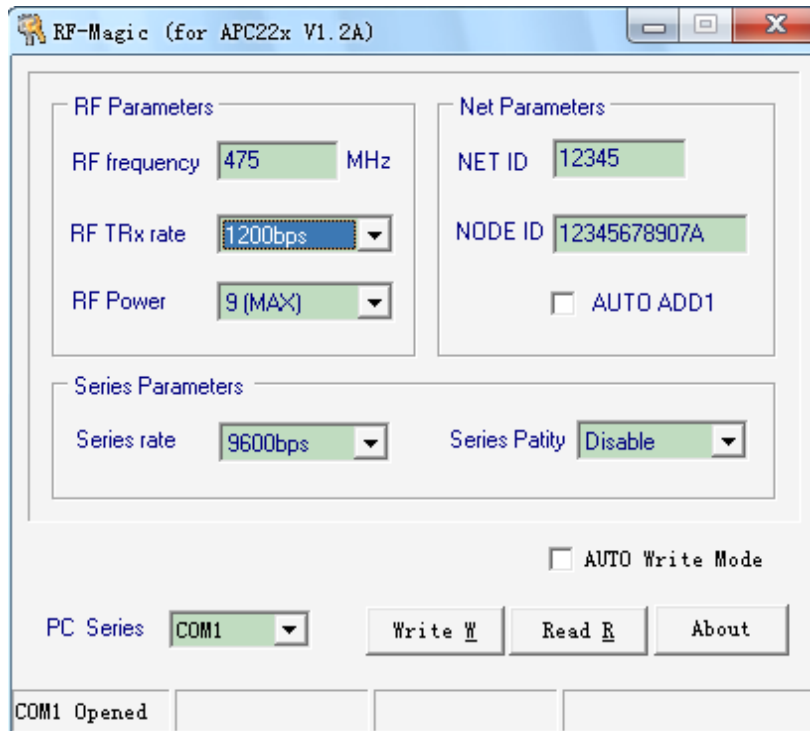
Figure 1: APPCON RF TOOL

♦ **BY MCU**. The module can work normally 50ms (T1) after powering on. When configuring the module, users need to switch the SET pin to low and the module then enters into setting mode after 1mS or more (T2). It will use 9600 bps (data rate) and no parity check as default format to communicate.
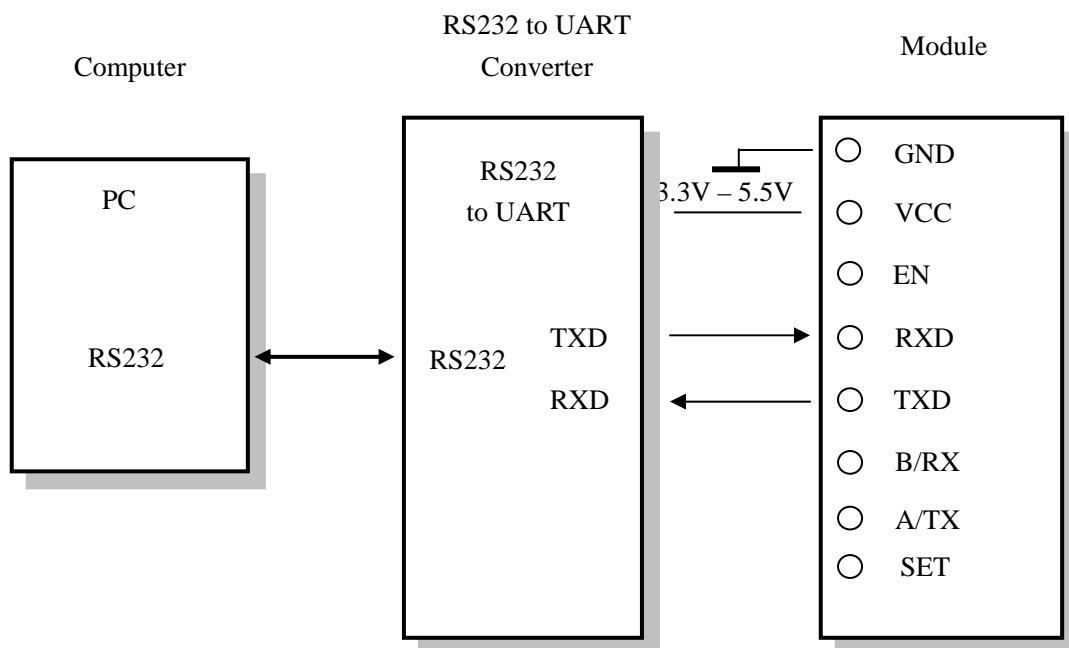

Figure 2: Connecting Diagram

When a command is sent to the module through the RXD pin, the module will send back response information by TXD pin in 200mS after it verifies the command is correct. When users check out the parameters are successfully set from the response information, the SET pin can be set to high and the module will work with the new settings in 10mS (T4).

Please note that users only can send command once when the SET pin is configured to low. If users want to revise the parameters after a successful setting, users must configure SET pin to high and then set it into low in order to reconfigure the module. After 100ms (T4), the module will work with the new parameters.
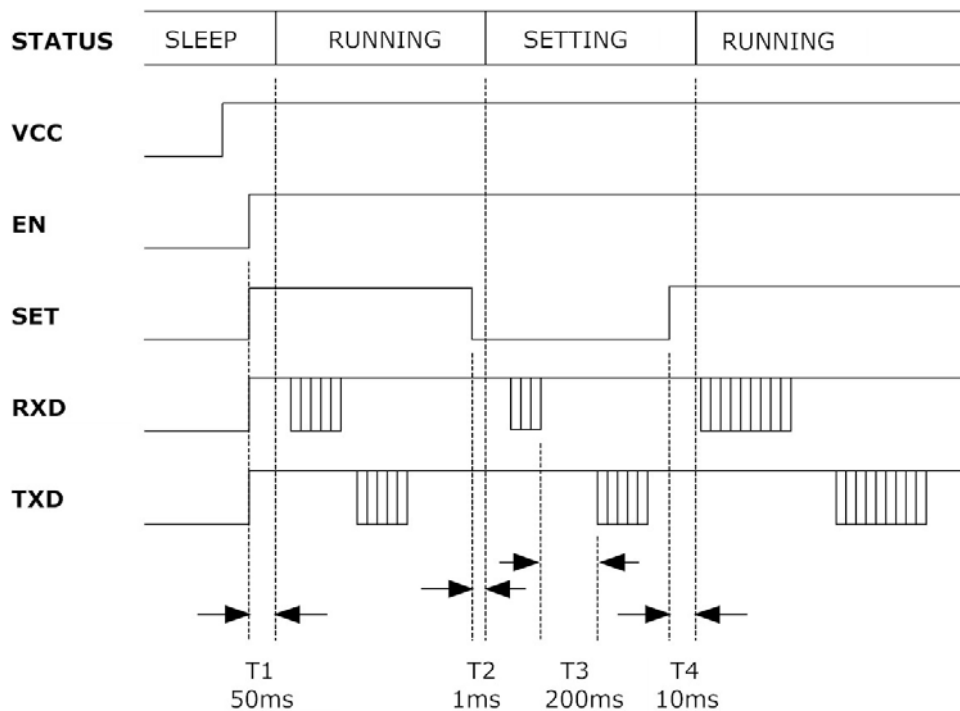

Figure 3: Timing Sequence for Setting Parameters

The commands of APC802 are in ASCII format. The default configuring data rate is 9600 bps and no parity check is adopted. The command set include two commands: Read command and Write command.

♦ **Read command:** RD↙
Response (from module): PARA_Freq_DR$_{FSK}$_P$_{OUT}$_DR$_{IN}$_Parity↙

♦ **Write command:**   WR_ Freq_DR$_{FSK}$_P$_{OUT}$_DR$_{IN}$_Parity↙
Response (from module): PARA_Freq_DR$_{FSK}$_P$_{OUT}$_DR$_{IN}$_Parity↙

Parameter	Unit	Length(Bytes)	Explanation
Freq.	KHz	3	434MHz = 434000
DRFSK	K bps	1	2400, 4800, 9600, 19200 bps equal to 1, 2, 3, 4
POUT	dB	1	0~9; 0 refers to -1dBm and 9 for 20dBm
DRIN	Kbps	1	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6 equal to 0, 1, 2, 3, 4, 5, 6
Parity		1	0: No parity; 1: Even parity; 2: Odd parity

Table 5 APC802 Parameter Coding

E.g. If the user wants to set the module work at Freq (434MHz), DR_{IN} (1.2K bps), P_{OUT} (20 dBm), DR_{FSK} (9.6k bps) and Parity (no parity), the command could be written as below:

Write Command:　　　　　WR_434000_3_9_0_0

Corresponding HEX code: 0x57,0x52,0x20,0x34,0x33,0x34,0x30,0x30,0x30,0x20,0x33,
　　　　　　　　　　0x20,0x39,0x20,0x30,0x20,0x30,0x0D,0x0A

Response:　　　　　　　PAPA_434000_3_9_0_0

Corresponding HEX code: 0x50,0x41,0x52,0x410x20,0x34,0x33,0x34,0x30,0x30,0x30,
　　　　　　　　　　0x20,0x33,0x20,0x39,0x20,0x30,0x20,0x30,0x0D,0x0A

Application

APC802 series are half-duplex wireless modules which can be used in point-to-point or point-to-multi point applications. In the latter application, users need to set one module as the host and others as client modules. Each module must have an unique ID and the coordination of communication is controlled by the host which send data and commands including ID. If the client module finds that the ID contained in the received message is the same as its own, it will continue to receive the remaining data; otherwise it will discard the coming message. In order to avoid any interference, only one module is allowed to work in transmitting mode at any time.
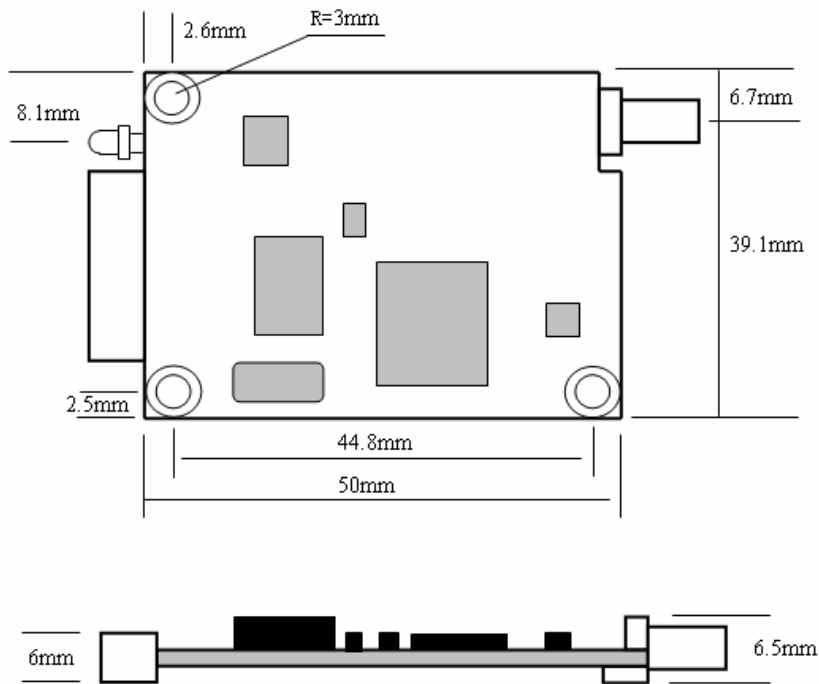
Mechanical Data

Figure 4: Mechanical Dimensions

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