# DRF7020M13N
## 13dBm Metering Node Module V2.01

### Features

- GFSK transceiver Module
- 433Mhz ISM frequency band
- 9.6k bps GFSK data rate
- 13dBm Max. output power
- Baud rate configurable
- Net ID configurable
- Address configurable
- Standby current < 5uA
- Supply voltage 3.5~5.5V

### Application

- Home automation
- Automatic meter reading
- Wireless data logger
- Wireless sensor network

## DESCRIPTION

DRF7020M13N is a low-cost sub-1 GHz transceiver module designed for operations in the MESH network applications, especially for AMR (Automatic Metering Reading) applications. 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).

The address length of DRF7020M13N is 6 bytes. Combining with DRF7020M12C (concentrator), the network can be constructed to 1024 nodes with 10 levels of routing.

## 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; pull-up resistor:47K Ohm |
| 5 | TXD | Output | UART output, TTL level |
| 6 | AUX | Output | Data In/out indication |
| 7 | SET | Input | Parameter setting pin; Low: effective |
| 8 | NC | --- | No connection |
| 9 | NC | --- | No connection |

**Table 1 DRF7020M13N Pin functions**

## ELECTRICAL SPECIFICATIONS

| Symbol | Parameter (condition) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| VCC | Supply Voltage | 3.5 | | 5.5 | V |
| Temp | Operating temperature range | -30 | 25 | 85 | °C |
| RH | Operating relative humidity | 10 | | 90 | % |
| Freq | Frequency range | 418 | | 455 | MHz |
| FDEV | Modulation deviation | | 28.8 | | KHz |
| Mod | Modulation type | | GFSK | | |
| IDD | Receive mode | | 28 | | mA |
| | Transmit mode @ 13dBm | | 40 | | mA |
| | Sleep mode | | | 5 | uA |
| Pout | Output power | | | 13 | dBm |
| Sen | Receiving sensitivity @14.4K bps | | -113 | | dBm |
| DRFSK | GFSK data rate | 2.4 | | 9.6 | Kbps |
| DRIN | Interface data rate | 1.2 | | 57.6 | Kbps |
| TS | Switching time | | 5 | | us |
| CHBW | Channel spacing | | 200 | | kHz |
| ZANT | Antenna Impedance | | 50 | | |

**Table 2 DRF7020M13N Electrical Specifications**

## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Min. | Max. | Units |
|---|---|---|---|---|
| VCC | Supply Voltage | -0.3 | 5.5 | V |
| VI | Input voltage | -0.3 | Vcc+0.3 | V |
| VO | Output voltage | -0.3 | Vcc+0.3 | V |
| TST | Storage temperature | -55 | 125 | °C |

**Table 3 DRF7020M13N Maximum Ratings**

## PARAMETERS SETTING

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

- **BY PC.** The interface of DRF7020M13N 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 DORJI 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.

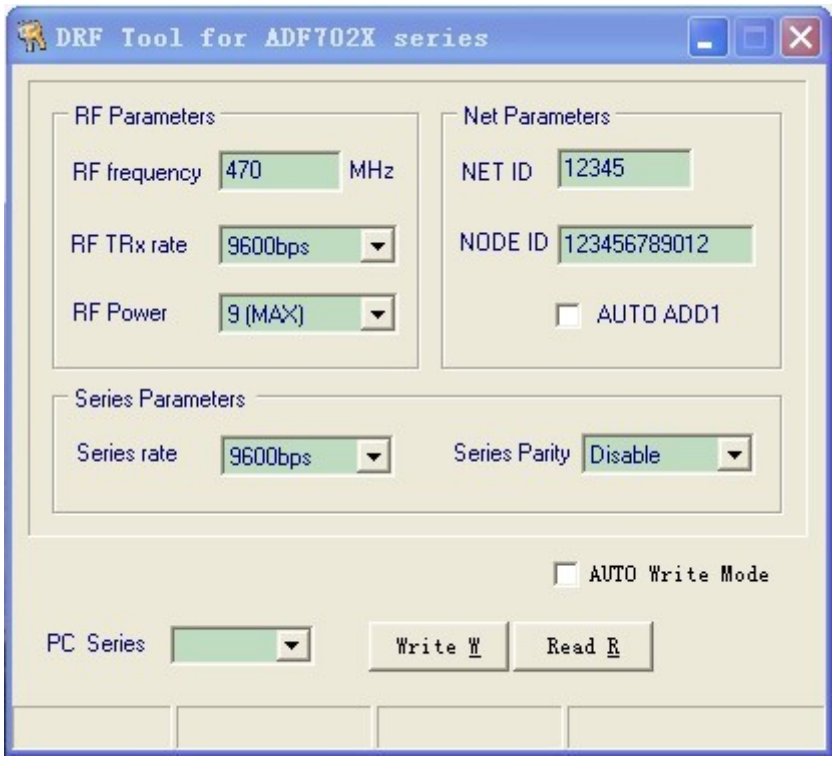


**Figure 1: DORJI RF TOOL**

- **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.

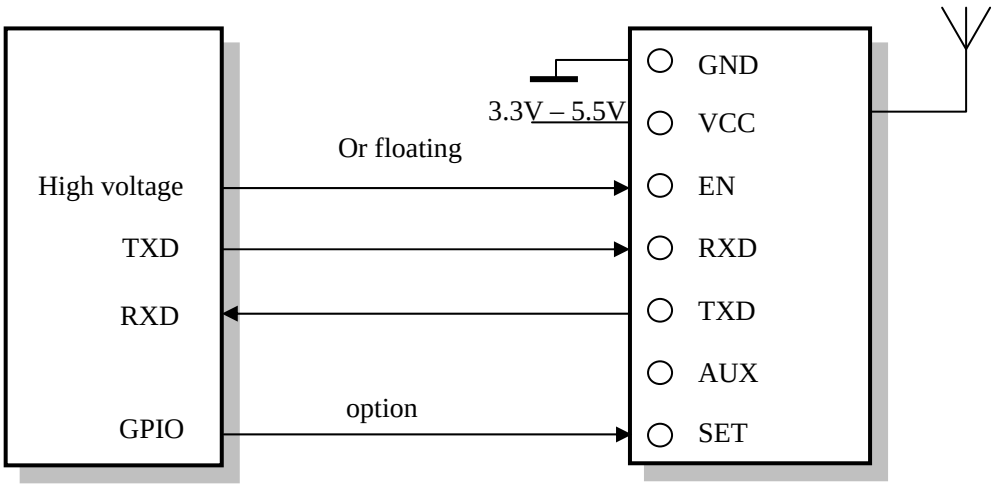


**Figure 2: Connecting Diagram**

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 keep in mind 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.

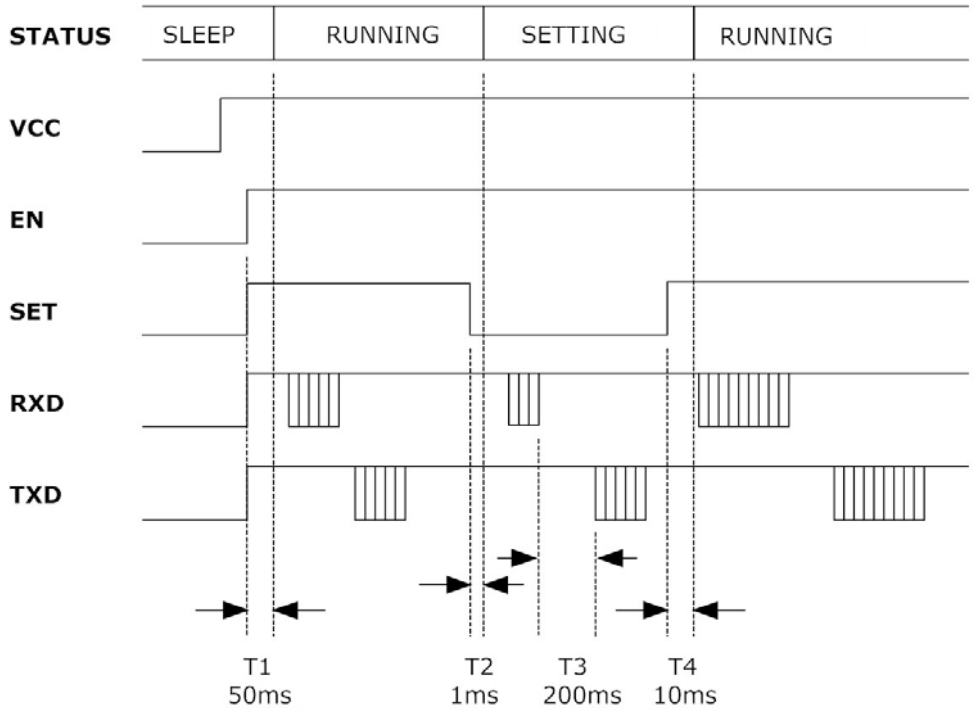


**Figure 3: Timing Sequence for Setting Parameters**

**Notes:** All of the parameters (such as Frequency, net ID, Address, etc.) can be set by PC tool. If the module is configured through MCU, only the frequency, net ID and address parameters can be changed.

The commands of DRF7020M13N 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_NetID_Address↙

- **Write command:** WR_ Freq_NetID_Address↙
  *Response (from module):* PARA_ Freq_NetID_Address↙

| Parameter | Length | Explanation |
|---|---|---|
| Freq. | 3 Bytes | 434MHz = 434000 |
| Net ID | 2 Bytes | 00000~65535 |
| Address | 6 Bytes | 0X000000000000 & 0XFFFFFFFFFFFF are reserved by system |
| DRIN | --- | 1.2k ~57.6k bps; available for PC tool |
| Parity | --- | 8E1/8N1/801; available for PC tool |

**Table 4 DRF7020M13N Parameter Coding**

E.g. If the user wants to set the module work at Freq (434MHz), Net ID (12345) and Address (0X0123456789AB), the command could be written as below:

**Write Command:** WR_434000_12345_0123456789AB↙

*Corresponding HEX code*: 0x57,0x52,0x20,0x34,0x33,0x34,0x30,0x30,0x30,0x20, 0X31,0X32,0X33,0X34,0X35,0X20,0X30,0X31,0X32,0X33, 0X34,0X35,0X36, 0X37,0X38,0X39,0X41,0X42, 0X0D, 0X0A

**Response:** PAPA _434000_12345_0123456789AB↙

*Corresponding HEX code:* 0X50,0X41, 0X52,0X41,0x20,0x34,0x33,0x34,0x30,0x30, 0x30,0x20, 0X31,0X32,0X33,0X34,0X35,0X20,0X30, 0X31,0X32,0X33, 0X34,0X35,0X36, 0X37,0X38,0X39, 0X41,0X42, 0X0D, 0X0A

## MECHANICAL DATA

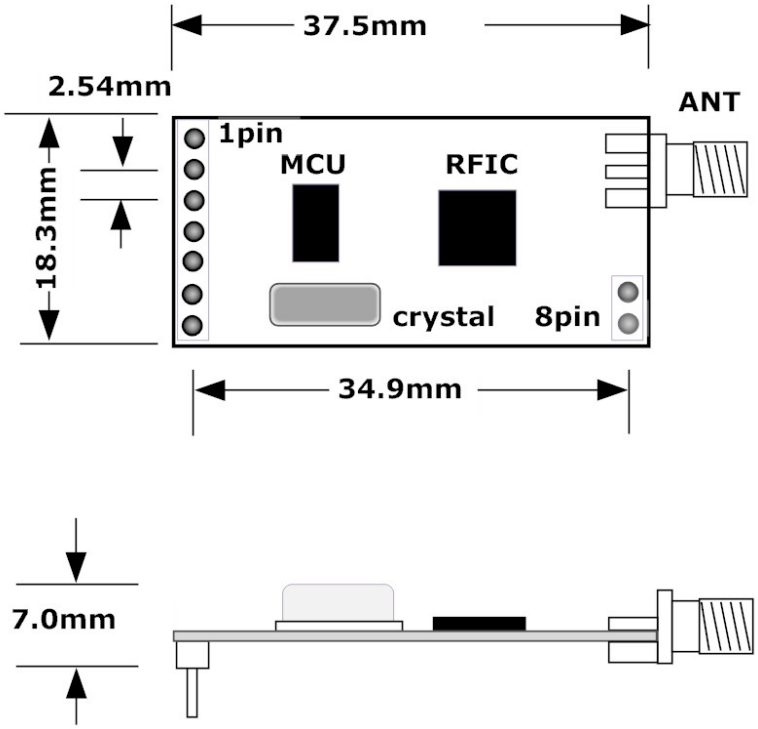


**Figure 4: Mechanical Dimensions**

## ORDERING INFORMATION

**DRF 7020 M 13 N— 043 A**
① ② ③④⑤ ⑥ ⑦

| Num | Symbol | Meaning |
|---|---|---|
| ① | RF module | RF GFSK module |
| ② | IC Type | ADF7020 |
| ③ | Module Type | Metering Module |
| ④ | Power | 13dBm output power |
| ⑤ | Module Function | Network Node |
| ⑥ | Freq. Band | 043: 433MHz |
| ⑦ | ANT Interface | SMA antenna connector |

**Table 5 Ordering information**

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