HM-380F64 Transparent Module Using Guide

Version	Update	Description
V1.0	2024.2.28	Initial version

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1. Description

HM-380F64 is a wireless data transmission module based on CMT2380F64 ultra-low power sub-1GHz wireless transceiver SoC chip. It has the advantages of ultra-low power consumption, strong sensitivity, long communication distance and low cost. Besides, the module transparent transmission function helps user fast realize wireless data transmission and save development time without understanding the complex RF configuration.

The core is 32-bit ARM Cortex-M0, up to 64KByte on-chip Flash and 8KByte on-chip SRAM, up to 48M. It integrates rich peripheral functions, supporting standard UART, I2C, SPI interfaces, RTC, timer, DMA and 12-bit high-speed ADC. Supports a variety of wireless packet formats and codec modes, up to 64-byte Tx/Rx FIFO, feature-rich RF GPIO, a variety of low-power operation modes and fast start mechanisms, high-precision RSSI, and fast manual frequency hopping, providing unlimited possibilities for secondary development.

2. Module Feature

- Simple to use, without any sub-1Ghz RF chip application experience.
- Support for transparent module using and secondary development
- The user interface adopts serial communication, full-duplex intercommunication, and 1200bps-115200bps baud rate range. (For more information, please refer to the AT instruction section for details).
- The packet length can be up to 254 bytes, excess part can be automatic subcontracting.
- Provides a variety of AT commands to configure module parameters (serial port rate, communication channel, data rate, transmiting power, sleep period, etc), and supports parameter power-off saving.
- The serial port cache is large, and 1K bytes of data can be

entered into the serial port at one time.

- Supports low power consumption mode, automatically works at sleep and receiving state with sleep time configured.
- Power consumption is as low as 1.5ua in sleep mode.

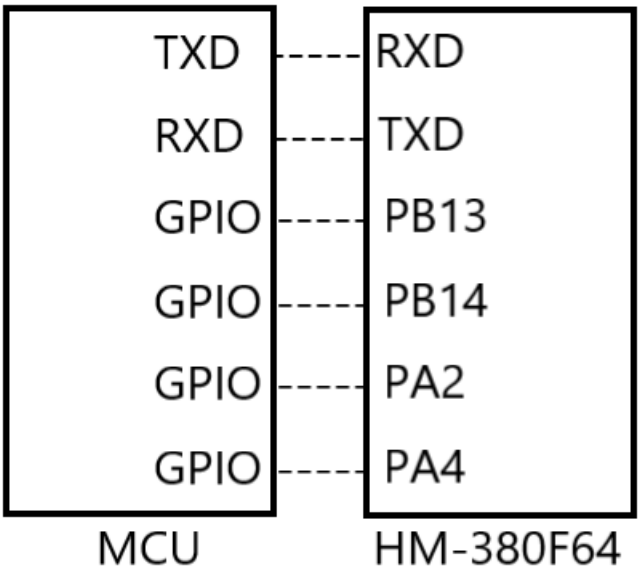
3. Electrical Characteristic

Test condition: Based on the default passthrough firmware, the power supply is 3.3V and the working temperature is 25℃.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating frequency	F_c	RFM380F64-433S2	426	434	442	MHz
		RFM380F64-868S2	860	868	876	MHz
		RFM380F64-915S2	907	915	923	MHz
Modulation	MOD			GFSK		
Receiving sensitivity	SENS	434MHz, DR = 2kbps, F_{DEV} = 10KHz		-118		dBm
		868MHz, DR = 2kbps, F_{DEV} = 10KHz		-116		dBm
		915MHz, DR = 2kbps, F_{DEV} = 10KHz		-115		dBm
Data rate of serial port	DR		1200	9600	115200	bps
Working voltage	VDD		1.8	3.3	3.6	V
Rx current	I_{Rx}	434MHz		10	15	mA
		868MHz		10	15	mA
		915MHz		10	15	mA
Tx current	I_{Tx}	434 MHz + 20 dbm		73	85	mA
		868 MHz + 20 dbm		71	85	mA
		915 MHz + 20 dbm		71	85	mA
Sleep current	I_{Sleep}			1.4		uA
Image rejection	IMR	F_{RF} = 433 MHz		35		dBc
		F_{RF} = 868 MHz		33		dBc
		F_{RF} = 868 MHz		33		dBc
Operation	T_{OP}		-40		+85	℃

temperature						

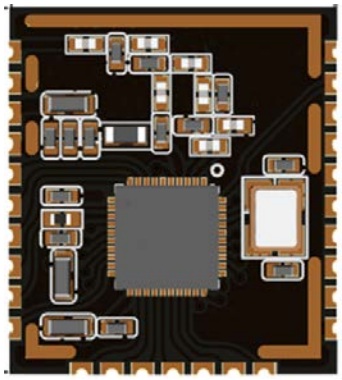
4. Module Application Connecting Diagram



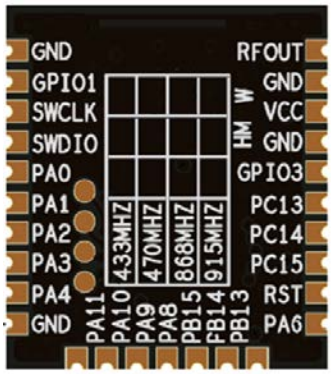
Module basic applications generally connect with six pins. TXD and RXD are communication pins for data of the serial port, PB13/PB14 is used to switch module working mode, PA2 is used to configure the module and wake up the module in sleep mode, and PA4 is used to output module status signal.

If there is no need in switching the operating mode, PB13/PB14 can be external pull up to the corresponding working level with no need to enter the configuration mode and module status signal indication, PA2/PA4 can be directly suspended to save the upper machine MCU I/O resources.

5. Module Pin



Module front view



Module back view

Pin Name	Port	Function Description
RFOUT	O	--
GND	--	Negative power supply
VCC	--	Power supply:1.8V-3.6V
GPIO3	O	Mapping DOUT output in Rx mode
PC13	IO	RTC_TAMP1/RTC_TS/RTC_OUT/WKUP1
PC14	IO	OSC32_IN
PC15	IO	OSC32_OUT
RST	I	Hard reset pin, low level effective
PA6	IO	SPI1_MISO/TIM3_CH1/TIM1_BKIN/TIM8_CH1/EVENT_OUT/LPUART_CTS /LPUART_TX/I2C2_SCL/LPTIM_ETR/BEEPER_OUT/COMP_OUT/ADC_IN6/ OPAMP_VOUT
PB13	I	Module working mode select port 0(level combination please refer to Section 7)
PB14	I	Module working mode selection port 1(level combination please refer to Section 7)
PB15	IO	SPI1_MOSI/SPI2_MOSI/I2S_SD/TIM1_CH3N/TIM8_CH3N/TIM8_CH4/ RTC_REFIN
PA8	IO	USART1_CK/TIM1_CH1/EVENT_OUT/MCO/SPI2_NSS/TIM8_CH2N
PA9	O	Serial port TXD

PA10	I	Serial port RXD
PA11	IO	USART1_CTS/TIM1_CH4/EVENT_OUT/I2C2_SCL/SPI2_MOSI/COMP_OUT
PA4	O	The module normally outputs high level when it is in run and wakeup mode, and outputs low level when it is in configuration mode/low power mode and sleep mode
PA3	IO	USART1_RX/USART2_RX/TIM8_CH4/TIM1_CH2/SPI1_MISO/I2S_MCLK/LPUART_RX/COMP_INP/ADC_IN3
PA2	I	Module in Run and Wake up mode Pull down PA2 to enter module configuration/Module in low power and sleep mode provide a negative pulse signal to PA2 to wake up the module
PA1	IO	USART1_RTS/EVENT_OUT/SPI1_NSS/I2S_WS/I2C1_SMBA/LPTIM_IN2/LPUART_TX/TIM8_CH2/TIM3_ETR/COMP_INP/ADC_IN1/OPAMP_VINP
PA0[1]	IO	USART1_CTS/USART2_CTS/USART2_RX/LPUART_TX/LPUART_RX/SPI1_SCK/I2S_CLK/LPTIM_IN1/TIM8_CH1/RTC_TAMP2/WKUP0/COMP_INM/COMP_OUT/ADC_IN0/OPAMP_VINP
SWDIO(PA13)	SWD Data debug interface	USART1_TX/USART1_RX/USART2_RX/I2C1_SDA/SPI1_SCK/I2S_CLK
SWCLK(PA14)	SWD clock debug interface	USART1_TX/USART2_TX/I2C1_SMBA/SPI1_MISO
GPIO1	RF的GPIO1	Configure the mapping function by using the AT command

Note:

[1] The module is delivered with the production test firmware, and the debugging interface will be closed after the module enters the production test by external pull down PA0. If the module needs to be developed again, please pay attention to the external PA0 when burning for the first time to avoid burning failure.

6. Serial Port Transparent Transmission Protocol Description

The wireless bidirectional communication between the user MCU and other transparent modules is established by connecting the module to the serial port.

After the module enters the configuration mode through the serial port, users can use the specified AT command to set the baud rate and communication channel of the serial port. The default serial port is configured as 9600bps 8N1.

During wireless data transparent transmission, the module's serial port Rx can input a maximum of 1K bytes at a time, and the module will subcontract or send a complete packet according to the data length (one packet supports a maximum of 254 bytes).

7. Operating Mode

The module has four operating modes, which are decided by different level combination of PB13 and PB14.

PB14	PB13	Mode	Description
1	1	Operating mode	In this mode, MCU and RF will always be in operating state, and RF will always be in the receiving state. After receiving data, RF will be sent out from the serial port immediately. If the data is received from the serial port, RF will turn to the transmitting state and send out the data.
0	1	Wakeup mode	This mode is similar to the operating mode, while there is a long preamble to wake up the module in low power mode, the data packet will take longer time, which depends on the low power period set by user. This mode is mainly used to communicate with modules in low power mode.
1	0	Low power consumption mode	In this mode, the MCU will enter into sleep state, that is, the serial port of the module cannot receive data. RF will be in a loop of sleep and receive working state, duration is depended on low power cycles set by users. The data received in this mode will output 5ms high level from PA4 pin and output data from the serial port.
0	0	Sleep mode	In this mode, both MCU and RF enter into sleep state, and the power consumption reaches the lowest.

The four modes are interchangeable, while low power mode and sleep mode cannot immediately respond to mode changes. It has to set the level of mode pins (PB13, PB14) and then give a negative pulse to the

wake pin (PA2) to wake up the module and switch to the corresponding working mode.

The module status indicates that pin PA4 remains high in run mode and wake mode and remains low in low power mode and sleep mode. User can detect the pin status to know if the module has switched modes.

In addition, when switching from operating mode to sleep mode, it is necessary to first switch to wakeup mode and then switch to sleep mode. Because when switching to the low power mode, the module enters the sleep state will not be able to respond to the subsequent mode level signals.

8. Parameter Configuration

The module supports online configuration. When the module is in operating mode or wakeup mode, pull down the PA2 pin to enter the configuration mode. The configuration mode can be determined by detecting whether PA4 is at low level. In configuration mode, the serial port baud rate is fixed at 9600bps 8N1. All parameters can be saved at power failure.

Command format configuration (HEX):

CMD is one byte. Parameter length is decided by the configured command. CheckSum is the accumualted checksum of CMD and Parameter in one byte.

0x5a	0x36	CMD	Parameter	CheckSum

After each command is sent, the module will reply to the execution result and the command format(HEX):

0x5a	0x36	REPLY	Parameter

	REPLY	Parameter
Command success	0x60	Version read: software version Other command: None
Command failed	0x61	None
Current configuration	0x62	It is used to reply to the read configuration; Return order: serial baud rate + communication channel + data rate + serial port rate and RF rate independent + GPIO1 output mapping + FEC switch + low power period + transmit power + sync word

Command Name	CMD	Parameter	Note
Serial baud rate	0x30	1 byte parameter 0x00：1200bps 0x01：2400bps 0x02：4800bps 0x03：9600bps 0x04：19200bps 0x05：38400bps 0x06：57600bps 0x07：115200bps	Default setting: 0x03：9600bps
Communication channel	0x31	1 byte parameter 0x00-0x20	Default setting: 0x10 The signal by step is 500Khz with 3 frequency band module range: 434M:426-442MHz 868M:860-876MHz 915M:907-923MHz
Data rate	0x32	1 byte parameter 0x00：1.2K 0x01：2.4K 0x02：4.8K 0x03：9.6K 0x04：19.2K 0x05：38.4K 0x06：57.6K 0x07：115.2K	Default setting: 0x03: 9.6K This parameter is valid only when the data rate and serial port rate are independent.
Whether the serial port and data rate are independent	0x33	1 byte parameter >0x00: dependent 0x00: independent	Default setting: 0x00: independent The data rate follows the serial port rate under independent situation, for example, if the serial port rate is 9600, the RF data rate is 9.6K. While in dependent situation, the parameter is set in the 0x32 command
GPIO1 mapping output	0x34	1 byte parameter 0x00：PREAM_OK_FLG 0x01：SYNC_OK_FLG 0x02：TX_DONE 0x03：FIFO_NMTY 0x04：STATE_IS_RX 0x05：STATE_IS_TX	Default setting: 0x01: SYNC_OK_FLG
FEC switch	0x35	1 byte parameter >0x00：on 0x00：off	Default setting: 0x00: off The parameters communicate

			normally when the RX and TX keep in consistent state.
Sleep period	0x36	1 byte parameter 0x00：500MS 0x01：1000MS 0x02：1500MS 0x03：2000MS 0x04：2500MS 0x05：3000MS 0x06：3500MS 0x07：4000MS	Default setting: 0x01 ：1000MS This parameter is the RF sleep time when the module enters low power mode.
Transmitting power	0x38	1 byte parameter 0x00：0DBM 0x01：4DBM 0x02：8DBM 0x03：12DBM 0x04：16DBM 0x05：20DBM	Default setting: 0x05：20DBM
Sync word	0x39	2 bytes parameter 0x0001~0xFFFE	Default setting: Sync word 0:0xCA Sync word 1:0xCA
Factory reset	0x40	1 byte parameter 0x23	Return all the parameters to factory state
Soft reset	0x41	1 byte parameter 0x25	The module performs a soft reset
Read all configurations	0x50	1 byte parameter ANY	Back to parameter sequence: Serial baud rate + commnunicating channel + data rate + Whether the serial port rate and RF rate are independent + GPIO1 output mapping + FEC switch + low power period + transmitting power + sync word
Setting all configuration	0x51	9 bytes parameter Parameter sequence: Serial baud rate + commnunicating channel + data rate + Whether the serial port rate and RF rate are independent + GPIO1 output mapping + FEC switch + low power period + transmitting power + sync word	
Read the version	0x53	1 byte parameter ANY	

9. Contacts

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