2.4GHz WIFI Wireless Transceiver Module

HM-WF8266 Datasheet

Version V1.0

1. Product overview

HM-WF8266WiFi module, developed by HOPERF Microelectronics Co., Ltd., provides a highly integrated Wi-Fi SoC solution with low power consumption, compact design and high stability to meet the needs of users.

HM-WF8266WiFi module has a complete and self-contained Wi-Fi network function, which can be used independently and run as a slave plane mounted on other host MCUs. When HM-WF8266 is used independently, it can be booted directly from external flash.

HM-WF8266WiFi module,built-in high-speed buffer memory is conducive to improving system performance and optimizing storage system. In addition, HM-WF8266 can be used as Wi-Fi adapter only through SPI/SDIO interface or I2C/UART interface, and can be applied to the design of any microcontroller.

HM-WF8266 WiFi module integrates antenna switch, radio frequency balun, power amplifier, low noise amplifier, filter and power management module. This compact design requires very few external circuits and minimizes the size of the PCB.

HM-WF8266 also integrates an enhanced version of the Tensilica's L106 diamond series 32-bit core processor, with on-chip SRAM main frequency support of 80 MHz and 160 MHz, and RTOS support. HM-WF8266 can use GPIO external sensors and other devices to achieve the minimum system resources in the early development and operation.

Functional principle of HM-WF8266:
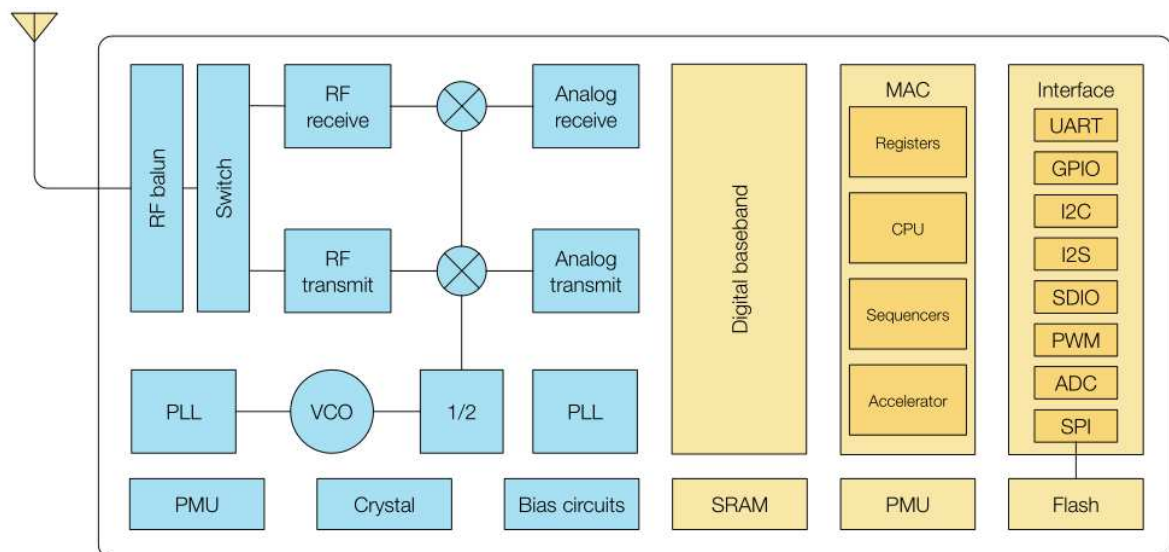
Advanced Features

1.Quickly switch between sleep mode and wake-up mode in the power-saving status. It has the characteristics of adaptive radio bias, front-end signal processing, fault removal and coexistence of radio system. Avoid interference from cellular/Bluetooth/DDR/LVDS/LCD.

2.Multiple sleeping mode to switch to adapt the different low-consumption environments

3.Perfect peripheral circuit, 4-layers, good impedance matching and better signal output; remarkable in terms of stability and anti-jamming ability;the PCB antenna tested & certificated by professional Labs and RoHS approved.

4.Customized design and support further developments based on customer needs, such as: Docking different cloud servers,design special solutions for customers, change Flash storage to 4M/8M/16M, etc.

2. Wi-Fi protocol

•Support 802.11 b/g/n/e/i.

•Support Wi-Fi Direct (P2P).

•P2P found that P2P GO mode (Group Owner), GC mode (Group Client) and P2P power management.

•Infrastructure BSS workstation mode/P2P mode/SoftAP mode.

•Support CCMP (CBC-MAC, counter mode), TKIP (MIC, RC4), WAPI (SMS4), WEP (RC4), CRC hardware accelerator.

• WPA/PA2 PSK and WPS.

• 802.11i security features: pre-authentication and TSN.

•Open interfaces for enterprise platforms, such as TLS, PEAP, LEAP, SIM, AKA or custom interfaces.

•Support 802.11n (2.4 GHz).

•Support MIMO 1*1 and 2*1, STBC, A-MPDU and A-MSDU frame aggregation technology, 0.4 us protection interval.

• WMM low power U-APSD.

•Multi-queue management, making full use of 802.11e standard's QoS transmission priority.

• UMA certification standards.

• 802.1h/RFC1042 Frame Package。

• Decentralized DMA, Zero Copy for data transmission operation, optimize CPU load.

• Antenna diversity and selection (software control hardware).

•Clock/power gating dynamically adapts to current connection conditions and achieves minimum power consumption along with power management conforming to 802.11 standard.

•Adaptive rate regression algorithm controls the optimal transmission rate and transmission power consumption based on actual signal-to-noise ratio (SNR) and packet loss information.

•Automatic retransmissions and replies at the MAC layer to prevent data packets from being discarded in slow host environments.

•Seamless roaming support.

3. Wi-Fi Key Features

• Support STA/AP/STA+AP working mode

• Support UTRT/GPIO/ADC/PWM/IIC/interface

• Built-in 1 10 bit high precision ADC

• Support for serial local upgrade and remote firmware upgrade (FOTA)

• Embedded LWIP protocol stack

• Power supply voltage input range: 2.5V-3.6V

• Transmit operating current: average 80mA 802.11n

• Receive operating current: 56mA 802.11n

• Deep sleep current: ≤20uA

• Security mechanism: WPA/WPA2

• Encryption type: WEP/TKIP/AES

• Upgrade firmware: UART Download/OTA (via network)

• Network Protocol: IPv4, TCP/UDP/HTTP/FTP/MQTT

• User Configuration: AT+ Instruction Set, Cloud Server, Android/iOS APP

4. Applications

• Household appliances

• Home automation

• Smart sockets, smart lights

• Mesh network

• Industrial wireless control

• Baby monitor

• IP camera

• Sensor Networks

• Wearable electronics

• Wireless location aware device

• Security ID label

• Wireless Positioning System Beacons

5. Pin Definition
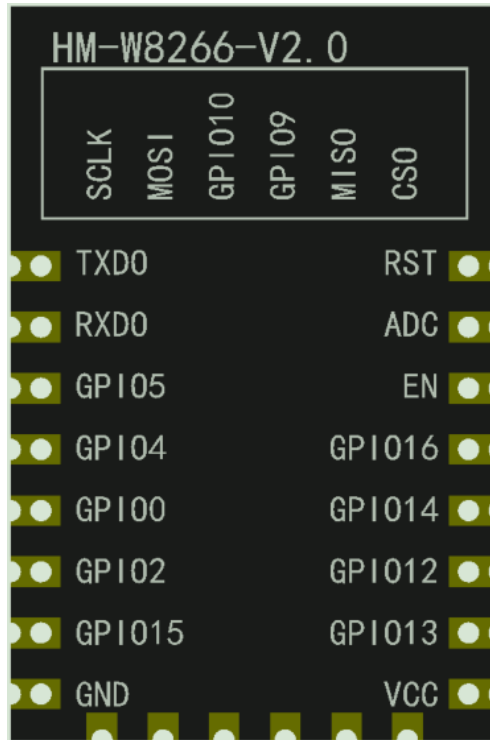
HM-WF8266Pin Diagram

HM-WF8266Pin function description

| No.	Pin Name	Functional Description
1	RST	Reset Pin, Active Low
2	ADC	AD conversion, Input voltage range 0~1V, the value range is 0~1024
3	EN	Chip Enabled Pin, Active High
4	GPIO16	Connect with RST pin to wake up Deep Sleep
5	GPIO14	HSPI_CLK
6	GPIO12	HSPI_MISO
7	GPIO13	HSPI_MISI,UARTO_CTS
8	VCC	Module power supply pin, Voltage 3.0V ~ 3.6V
9	GND	GND
10	GPIO15	MTDO,HSPICS,UARTO_RTS
11	GPIO2	UART1_TXD
12	GPIO0	HSPI_MISO;I2SI_DATA
13	GPIO4	IO
14	GPIO5	IR_R
15	RXD0	UARTO_RXD
16	TXD0	UARTO_TXD

6. Electrical Characteristics

Test conditions: power supply 3.3V, temperature 25 °C

Electrical Parameter List

Parameter	Status	Min	Typ	Max	Unit
Working frequency	HM-WF8266	2412	2412	2484	MHz
Package	SMD22				
Dimensions	24*16*3(±0.2)MM				
SPI Flash	Default 32MB				
Interface	UART/GPIO/ADC/PWM				
I/O	8				
Receiving sensitivity	CCK,1 Mbps		-90		dBm
	CCK,11Mbps		-85		dBm
	6Mbps(1/2 BPSK)		-88		dBm
	54Mbps(3/4 64- QAM)		-70		dBm
	HT20,MCS7(65Mbps,72Mbps)		-67		dBm
	802.11 b (11 Mbps)		-91		dbm
	802.11 g (54 Mbps)		-75		dbm
	802.11 n (MCS7)		-72		dbm
Serial port rate		300	115200	4608000	bps
Operating Voltage		2.5	3.3	3.6	V
Receiving operating current	802.11b,1024Bytes 包长，-80dBm		50		mA
	802.11g,1024Bytes 包长，-70dBm		56		mA
	802.11n,1024Bytes 包长，-65dBm		56		mA
发射功率	802.11b,CCK 11Mbps		17		dbm
	802.11g,OFDM 54Mbps		15		dbm
	802.11n,CCK MCS7		13		dbm
Transmit operating current	802.11b,CCK 11Mbps +17dbm		170		mA
	802.11g,OFDM 54Mbps +15dbm		140		mA
	802.11n,CCK MCS7 +13dbm		120		mA
Deep sleep current	Deep Sleep			20	uA
Adjacent frequency suppression	OFDM,6Mbps		37		dB
	OFDM,54Mbps		21		dB
	HT20,MCS0		37		dB
	HT20,MCS7		20		dB
Operating temperature		-40		+85	℃

7. Module Dimensions
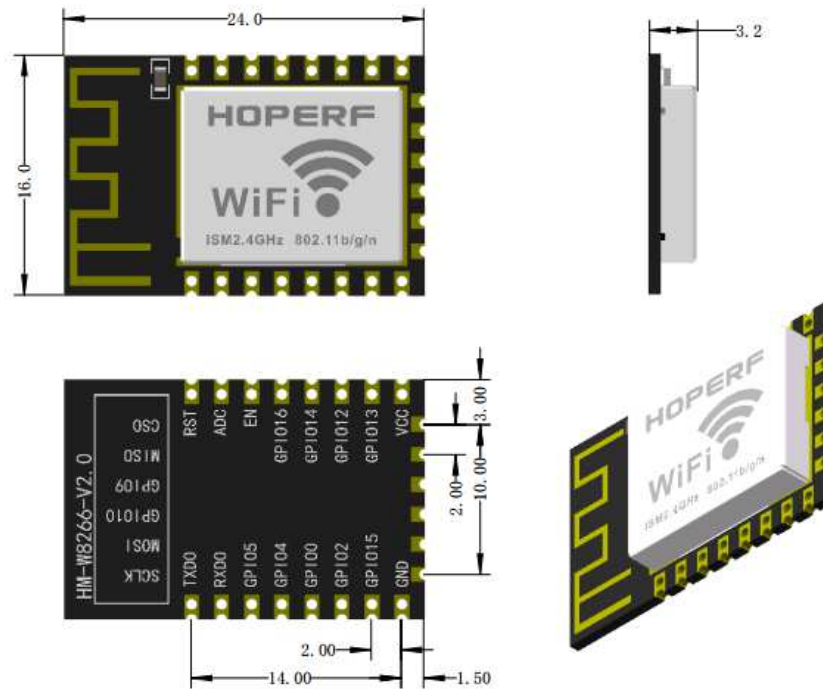
Unit: mm
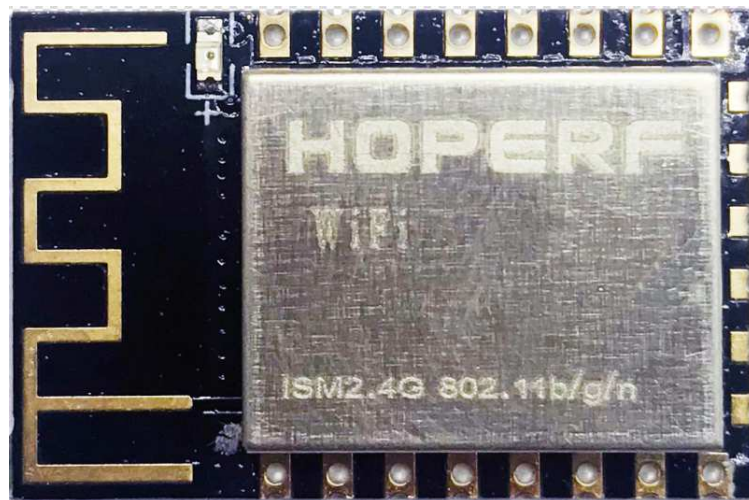
Module Photo

8. Power Management

Unless otherwise stated, the following power consumption data is tested with a supply voltage of 3.3V and an ambient temperature of 25°C; the Tx power consumption data is based on a 50%

transmit duty cycle.

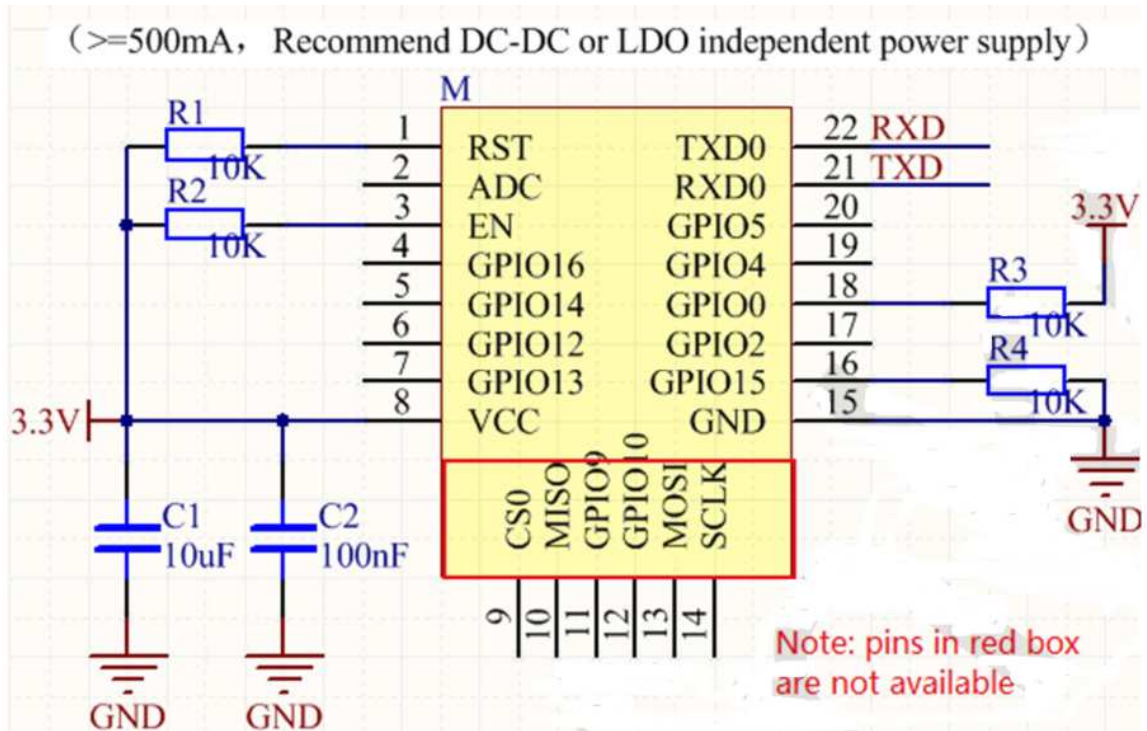| Power Mode	Description	Power Consumption
Active (RF working)	Wi-Fi TX packet	Please refer to 5-2.
	Wi-Fi RX packet	
Moderm-sleep[1]	CPU is working	15 mA
Light-sleep[2]	-	0.9 mA
Deep-sleep[3]	Only RTC is working	20 uA
Shut down	-	0.5 uA

Notes:

① Modem-sleep mode is used in the applications that require the CPU to be working, as in PWM orI2S applications. According to 802.11 standards (like U-APSD), it shuts down the Wi-Fi Modem circuit while maintaining a Wi-Fi connection with no data transmission to optimize power consumption. E.g. in DTIM3, maintaining a sleep of 300 ms with a wakeup of 3 ms cycle to receive AP's Beacon packages at interval requires about 15 mA current.

② During Light-sleep mode, the CPU may be suspended in applications like Wi-Fi switch. Without data transmission, the Wi-Fi Modem circuit can be turned off and CPU suspended to save power consumption according to the 802.11 standards (U-APSD). E.g. in DTIM3, maintaining a sleep of300 ms with a wakeup of 3ms to receive AP's Beacon packages at interval requires about 0.9 mA current.

③ During Deep-sleep mode, Wi-Fi is turned off. For applications with long time lags between data transmission, e.g. a temperature sensor that detects the temperature every 100s, sleeps for 300sand wakes up to connect to the AP (taking about 0.3 ~ 1s), the overall average current is less than1mA. The current of 20 µA is acquired at the voltage of 2.5V.

9. Application circuit

(>=500mA， Recommend DC-DC or LDO independent power supply）

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