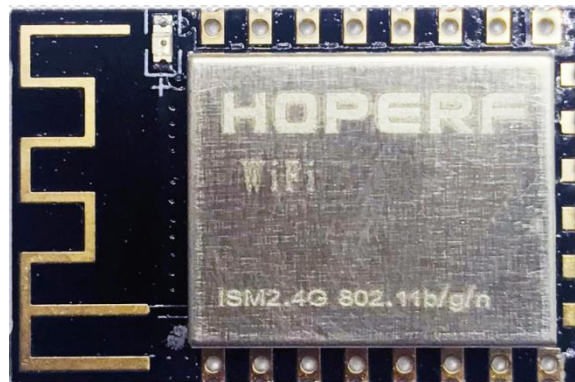# 2.4GHz WIFI Wireless Transceiver Module Specification

HM-WF8266A

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.

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
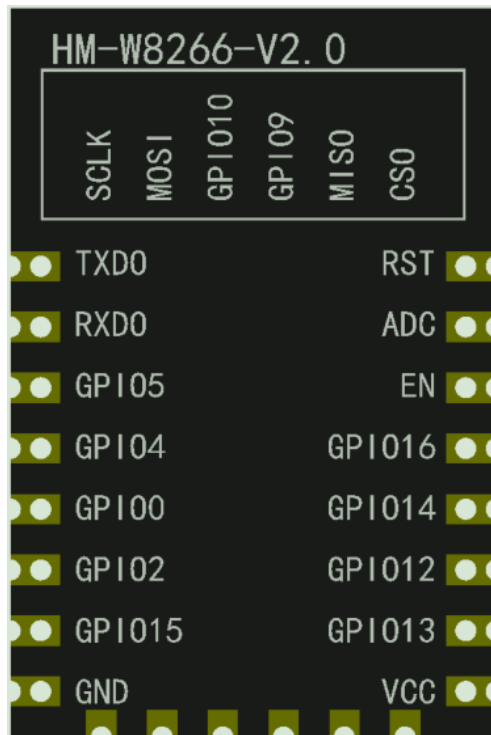
HM-WF8266Pin Diagram

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		-40		+85	°C

temperature					

7. Module Dimensions
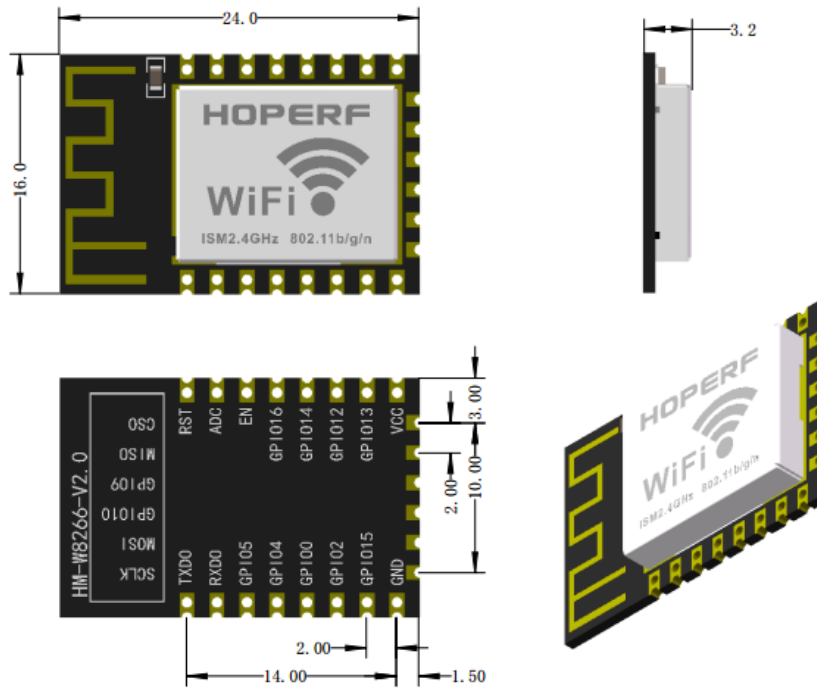
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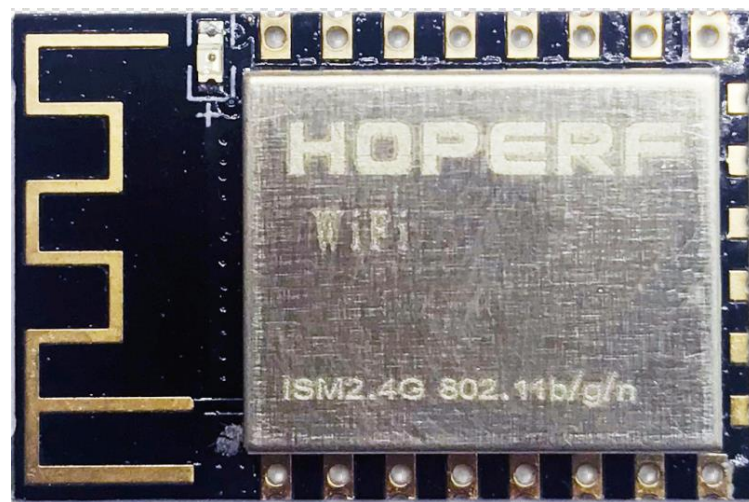
Module Photo

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.

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FCC NOTICE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

To assure continued operation, follow the attached installation instructions and use only shield cables when connecting to other devices. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet appareil est conforme à la partie 15 des règles de la FCC. Son fonctionnement est soumis aux deux conditions suivantes : (1) Cet appareil ne doit pas provoquer d'interférences nuisibles; et (2) cet appareil doit accepter toutes les interférences reçues, y compris celles susceptibles d'entraîner un dysfonctionnement de l'appareil.

Déclaration de la Federal Communication Commission sur les interférences

Cet équipement a été testé et déclaré conforme aux limites applicables aux appareils numériques de classe B, conformément à la partie 15 des règles de la FCC. Ces limites sont conçues pour offrir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et diffuse des ondes radio; s'il n'est pas installé ni utilisé conformément aux instructions dont il fait l'objet, il risque de provoquer des interférences gênantes avec les communications radio. Toutefois, rien ne garantit l'absence d'interférences dans une installation particulière. Si cet équipement provoque des interférences avec la réception radio ou télévision (ce qu'il est possible de déterminer en mettant l'équipement hors tension, puis à nouveau sous tension), nous invitons l'utilisateur à tenter de corriger le problème en prenant l'une ou plusieurs des mesures suivantes :

• Réorienter ou déplacer l'antenne de réception;
• Augmenter la distance séparant l'équipement et le récepteur;
• Connecter l'équipement à un circuit différent de celui auquel le récepteur est connecté;
• S'adresser au revendeur ou à un technicien radiotélévision expérimenté pour obtenir de l'aide.

Mise en garde : les modifications ou changements non expressément approuvés par Notre peuvent entraîner l'annulation du droit d'utilisation de cet appareil.

If the FCC/IC identification number is not visible when the module is installed inside the host, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module Contains FCC ID: 2ASEO-HM-WF8266A" and IC: 24999-WF8266A" or "Contains FCC ID: 2ASEO-HM-WF8266A and IC:24999-WF8266A, any similar wording that expresses the same meaning may be used. RF warning statement: The device has been evaluated to meet general RF exposure requirement. The device can be used in public exposure condition without restriction.