VM5G Product Specification

VM5G is an industrial-grade dual-band WiFi repeater, bridge, and router module meticulously developed by Houtian Network. It operates simultaneously on both 5GHz and 2.4GHz bands, utilizing digital-analog temperature-compensated frequency stabilization technology (TAFC) to deliver more stable WiFi signals with reduced disconnections.

Hardware Features:

- Support wide voltage DC5V-DC24V power supply, two-stage automatic overvoltage protection (Protection voltage upper limit 29V);
- Support reverse connection protection of power supply;
- The output power of the power supply is not less than 10W (typical power supply 5V/2A, ripple less than 100mV);
- WiFi Work Band: 2.4GHz + 5Ghz;
- WiFi transmission rate: 300Mbps(2.4G)+900Mbps(5G);
- RF Power: 2.4G is 17dBm/18.5dBm, 5G is 19dBm/22dBm optional;
- Point-to-point pairing uses barrier-free maximum transmission distance: 2.4GHz:30m-100m、5GHz:100-400m;
- The module built-in LNA, the receiving sensitivity 2.4G：-70dbm、5G:-76dbmi;
- Standard package external antenna: 2*3dBi 5G antennas, 2*3dBi 2.4G antennas;
- Built-in intelligent automatic start stop cooling fan.(Fan is not included as standard)
- Provide a TTL（3.3V） level UART data transparent transmission interface;
- Adopt temperature compensated auto frequency control technology, WiFi signal is more stable and not easy to drop;
- Work Environment temperature: -20℃ to 55℃.

Function Features:

- Support router and bridge repeater mode;
- In router mode, support WiFi WAN access;
- In router mode, support WAN/LAN switching of wired network ports;

- Support WiFi smart bridge repeater, can achieve WiFi to wired, wired to WiFi function;
- Support 802.11ac, 802.11a, 802.11n and so on transmission protocol;
- Support UART to UDP/TCP data bidirectional transparent transmission.
- Support UDP broadcast and VONETS format (one module can forward multiple IPS), and choose TCP client or TCP server forwarding mode;
- Support WiFi hotspot automatic reconnection, two hotspot matching methods: Full match authentication mode, SSID and password authentication mode;
- WiFi hotspot memory, maximum memory 100 hotspots;
- Support connecting more than 20pcs WiFi terminal at the same time;
- Support SSA protocol, built-in hotspot signal strength detection and reporting function to realize WiFi mobile positioning;
- Support hotspot forced disable, WiFi hardware forced disable;
- Hotspot connection parameter import and export function;
- Adopt VDNS virtual domain configuration technology to solve the user's trouble of configuration;
- Support WEB management, Chinese and English configuration interface;
- Support upgrade online;
- Support IP layer transparent transmission and MAC layer transparent transmission two bridge modes to meet various bridge applications:

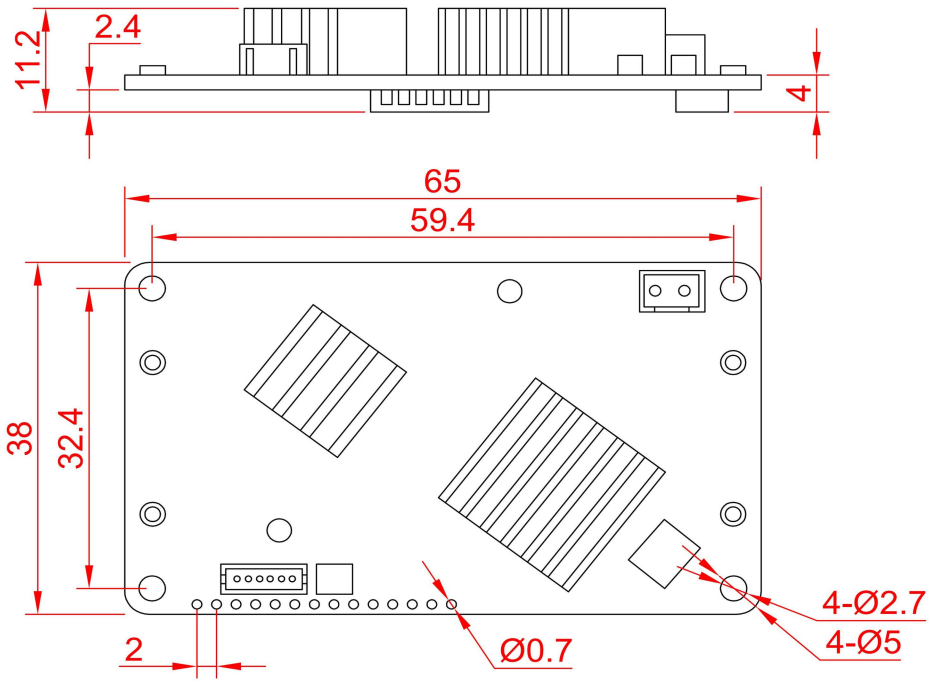
  IP layer transparent transmission (factory default), transparent transmission of IP layer data, can meet most of the bridge applications;

  MAC layer transparent transmission all data above the MAC layer (link layer) and the MAC layer, including IP layer data; MAC transparent transmission can solve some special applications for MAC layer encryption, such as GoPro camera, Cisco AP, Hikvision monitoring.

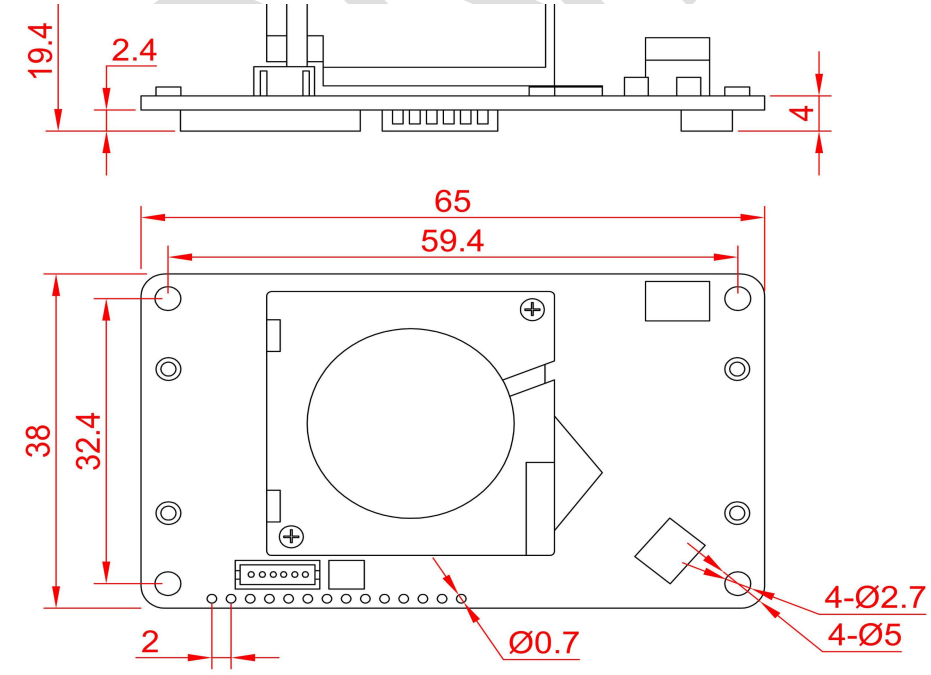
  system, etc.

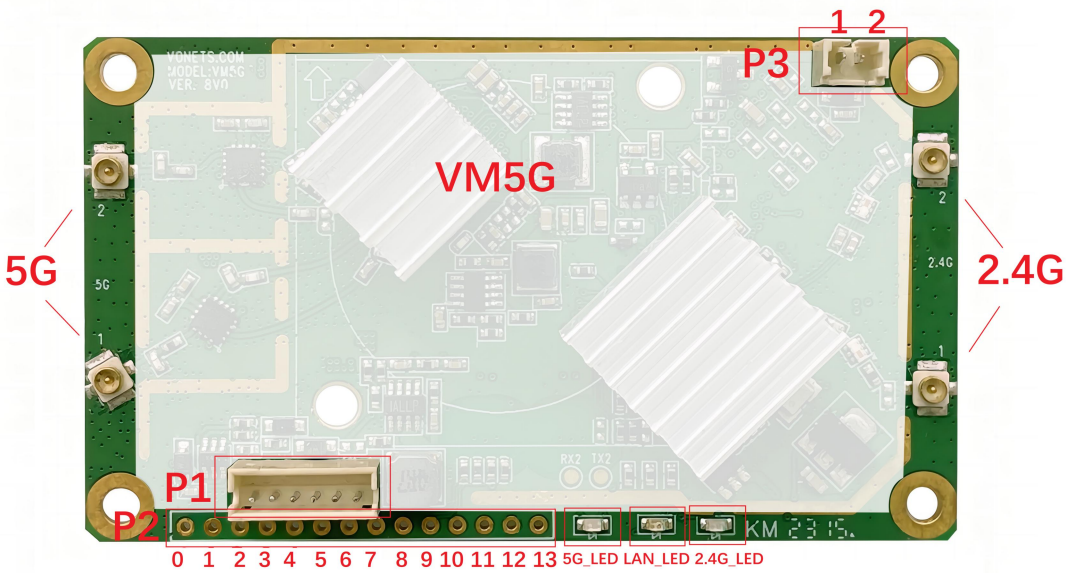
One: Module Diagram (mm):

Standard Version：



Fan style：





Note: Because the module is too small, the four metal screws are easy to lead to deformation of the module, chip desoldering, it is recommended to use plastic screws, and only used to locate can be, to leave a little room for manoeuvre!

Two: P1, P2,P3 interface Definition Form

PIN Number		PIN Definition	Function Description
P1	P2		
	0	Module power enable (Version 8.0 hardware proprietary)	● Module power enable control pin, the default state is power enable. If the control voltage at this pin is less than 1V, the module power supply is turned off.
1	1	RX-	● Ethernet Port; ● The factory default is LAN port, in router mode, you can also log in to the configuration page for WAN/LAN interchange; ● The 1 to 4 PIN of P2 and P1 are connected in parallel, which is actually the same network port.
2	2	RX+	
3	3	TX-	
4	4	TX+	
5	5	GND	Module Power Ground
6	6	VIN+	DC5V--24V, Power supply
	7	LAN_LED_N	● Status Indicator of Ethernet port signal output; ● Open collector output, built-in 330Ω current limiting resistor, output current is no more than 10mA.
	8	5G_LED_N	● 5G Status Indicator signal output; ● Open collector output, built-in 330Ω current limiting resistor, output current is no more than 10mA.
	9	2.4G_LED_N	● 2.4G Status Indicator signal output; ● Open collector output, built-in 330Ω current limiting resistor, output current is no more than 10mA.
	10	UART1_TX	● UART/UDP data transparent transmission interface (UART to UDP);
	11	UART1_RX	

PIN Number		PIN Definition	Function Description	
P1	P2			
			● TTL level.	
	12	GND	Module Power Ground	
	13	Reset	● Reset signal input, after module starts normally, keep this input pin low for more than 3 seconds, module will restore factory parameters; ● Do not power off during the factory reset, otherwise the module may be damaged.	
P3	1	Fan control Output positive pole	● Connect the positive pole of the fan power cord.	P3 interface is proprietary to version 8.0 hardware.
	2	Fan control Output negative pole	● Connect the negative pole of fan power cord.	
Precautions for installation: 1. It is recommended to use plastic screws or put a soft gasket on the installation. 2. Do not tighten the screws too tightly, otherwise the PCB may be deformed and damage the module.				

Three: Hardware Spec

Interface P1	1) It is used to connect the professional power supply and network two-in-one dedicated cable provided by us; 2) Using a dedicated cable, can direct power and network connection testing;
Interface P2	P2 interface Definition Form
LED	Status Indication: Ethernet Port Status Light (Yellow); 2.4G WiFi Connection Status Light (Blue); 5G WiFi Connection Status Light (Green);
Antenna Interface	2*3dBi 2.4G Whip antennas 2*3dBi 5G Whip antennas
Module Size	65mm x 38mm x 8.3mm（L x W x H）
Module Weight (Including Antennas)	115g (including antenna)

Four: WiFi Related

Protocol Standard	IEEE 802.11ac, IEEE 802.11a; IEEE 802.11n, IEEE 802.11g, IEEE 802.11b;
WiFi Transmission rate	2.4GHz band: 300Mbps 5GHz band: 900Mbps

Basic Function	1) Router mode, support WiFi WAN access and WAN/LAN exchange; 2) Transparent bridge (IP layer transparent, MAC layer transparent); 3) WiFi Hotspot exchange, WiFi hardware exchange; 4) 2.4G WiFi mode option: 11B/G/N, 11B/G, 11N, 11G, 11B; 5G WiFi mode option: 11AC/AN/A, 11AC/AN, 11A/N, 11A, 11N; 5) WiFi hotspot automatic reconnection, two hotspot matching methods: Full match authentication mode, SSID and password authentication mode; 6) WiFi hotspot memory, maximum memory 100 hotspots; 7) SSA signal strength detection and reporting function ; 8) Hotspot connection parameter import and export function;
Supported Band	2.4G band channel: 1-14; 5G band channel: 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153,157,161, 165
WiFi RF Power	2.4G: Normal power 17dBm; Enhanced power of 18.5dBm. 5G: Normal power 19dBm; Enhance the power by 22dBm.
Compliance acceptance sensitivity	2.4G: Normal power 15dBm; Enhanced power of 16.5dBm. 5G: Normal power 19dBm; Enhanced power of 23dBm.
LNA Sensitivity	14dBi
Application Method	WiFi Repeater (WiFi signal repeater), can extend WiFi transmission distance; WiFi Bridge: IP layer transparent transmission, MAC layer transparent transmission; WiFi access point (AP);
WiFi Security	64/128/WEP security; WPA-PSK/WPA2-PSK, WPA/WPA2 Security mechanism;
System Function	Firmware Upgrade Reboot device Reset factory Account and password revise

Five: Electrical performance parameters

VM5G-V8.0 **Fan version**

1.Power supply parameters				
SupplyVoltage Range	Input Power	Typical PowerSupply	Ripple	Overvoltage protection
DC5V-DC24V	≥10W	12V/1A	<100mV	29V
2. Working Electrical Performance Parameter Measurement Form (Environment Temperature: 25℃)				

1.Power supply parameters					
SupplyVoltage Range		Input Power	Typical PowerSupply	Ripple	Overvoltage protection
Work Band	Supply Voltage	Work Stage	Work Current(mA)		Main chip temperature (℃)
2.4G	12V	Booting Up	150-400		30-40
		Standby	250-350		35-55
		Transfer Data	300-450		55-65
5G	12V	Booting Up	150-400		30-40
		Standby	250-350		35-55
		Transfer Data	300-500		55-65
Dual Band	12V	Booting Up	150-400		30-40
		Standby	250-350		40-60
		Transfer Data(2.4G)	300-450		60-70
		Transfer Data(5G)	300-500		65-70
		Transfer Data (Dual Band）	350-550		65-70

VM5G-V8.0 Standard Edition

1.Power supply parameters					
SupplyVoltage Range		Input Power	Typical PowerSupply	Ripple	Overvoltage protection
DC5V-24V		≥10W	12V/1A	<100mV	29V
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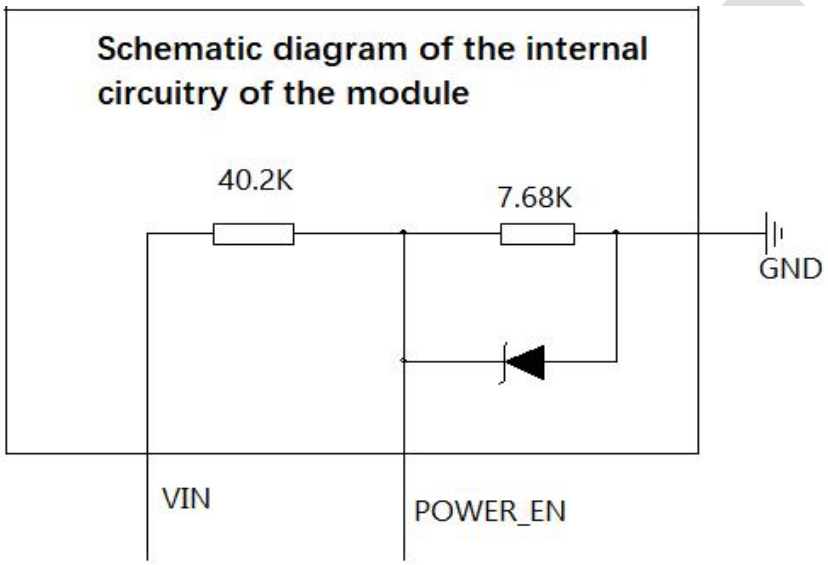
		Standby	250-350		35-55
		Transfer Data	300-500		55-65
Dual Band	12V	Booting Up	150-400		30-40
		Standby	250-350		40-60
		Transfer Data(2.4G)	300-450		60-70
		Transfer Data(5G)	300-500		65-70
		Transfer Data (Dual Band）	350-550		65-70

Six:Common problems:

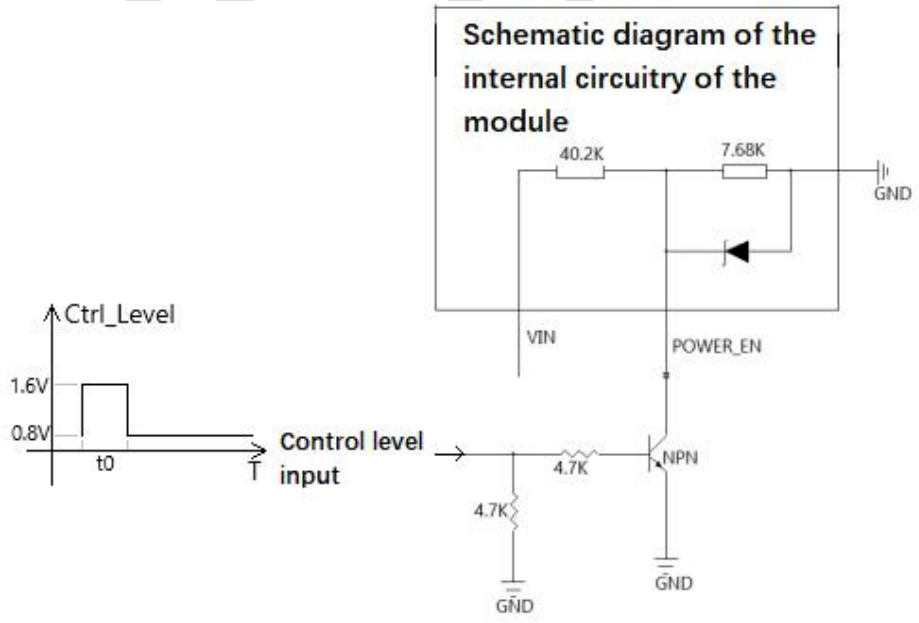
When using a non-independent power supply such as battery or motherboard to supply power to the module, the voltage may be unstable or have a large peak value at the moment of

power supply startup, at this time, it is easy to damage the configuration parameters in the flash memory of the module. It is recommended to do a delayed start for the module, until the power supply voltage stabilizes before supplying power to the module. Module POWER_EN pin (PC-0) description is as follows: external control circuit will POWER_EN pin to a low level (1.0V or less) to close the module power supply; POWER_EN pin to a high level (1.6V or more) to open the module power supply.



The control module delayed start circuit reference design has the following two options:

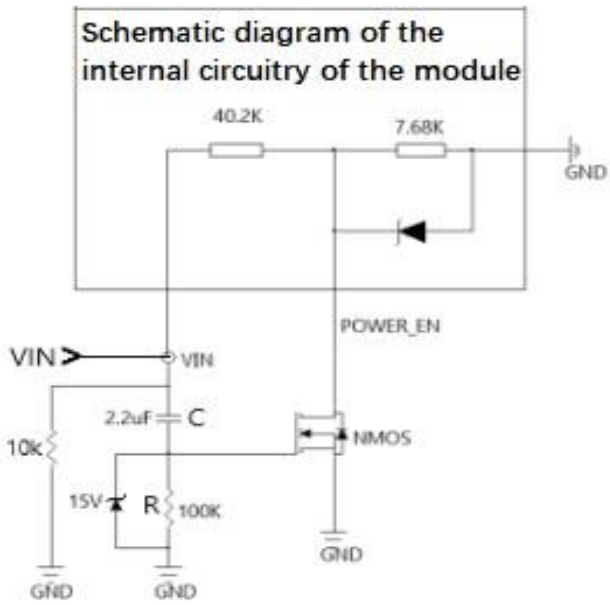
- Reference design 1



POWER_EN foot and GND access module, MCU connected to the microcontroller, the motherboard power-up so that the control level output high, transistor conduction, POWER_EN foot is low, the module does not start; power supply stabilization so that the control level has been at a low level, the transistor cutoff, the POWER_EN foot is a high level, the module is normal operation.

The above figure t0 is the length of the delayed start.

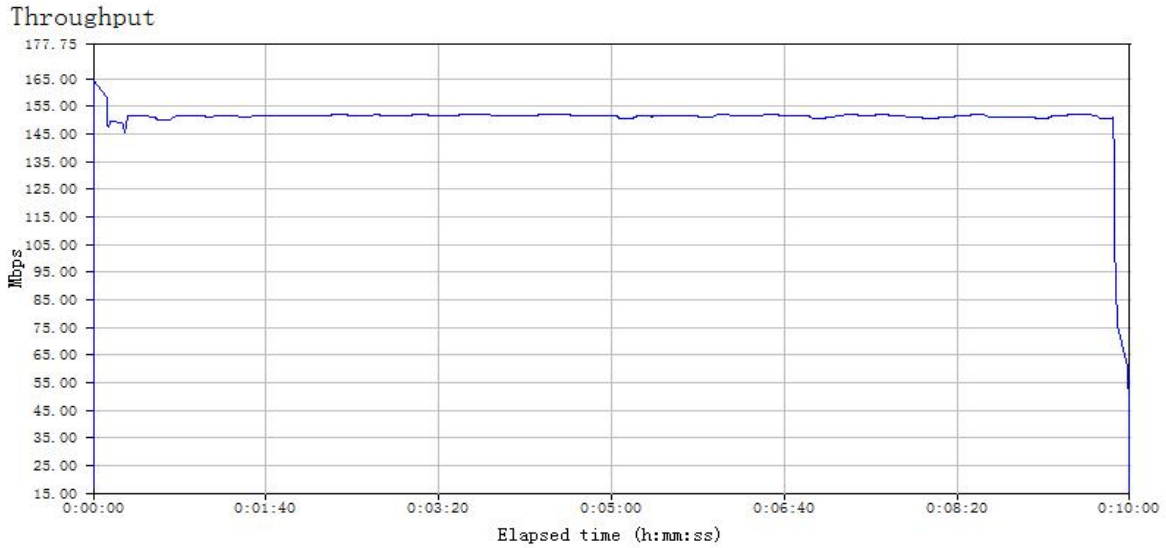
- Reference Design 2



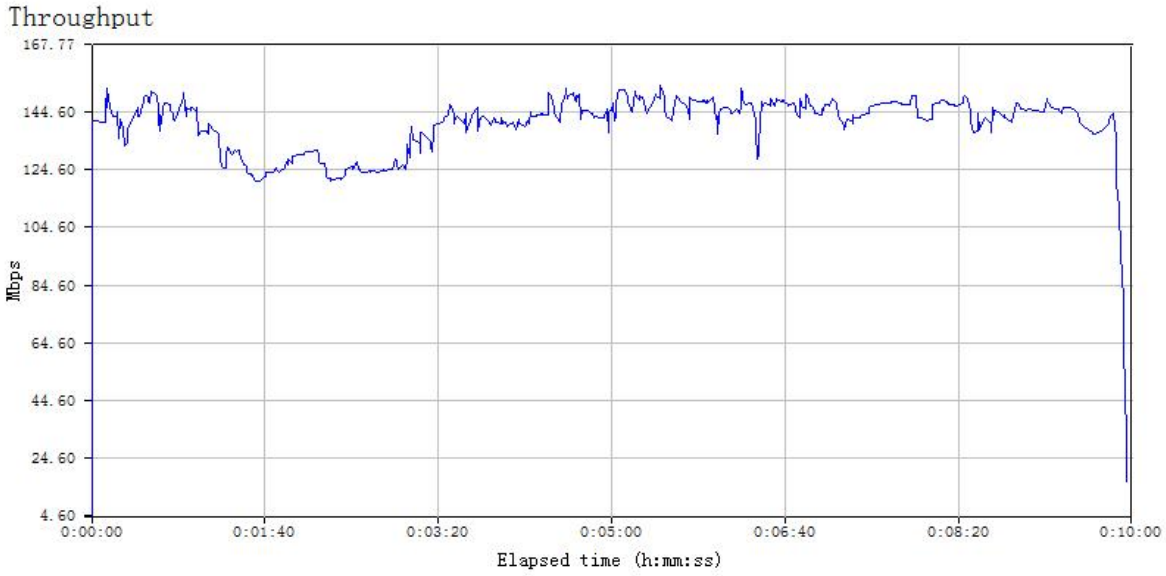
VIN, POWER_EN foot and GND access module, motherboard power-up VIN to capacitor C charging, at this time the MOS tube conduction, POWER_EN foot for the low level, the module does not start; capacitor C is full of MOS tube cutoff, POWER_EN foot for the high level, the module starts. Resistor R is used to adjust the capacitor charging time, the larger the resistor charging time is longer delay start time is longer, 10K resistor is used for frequent unplugging and plugging the power supply when the capacitor discharges, 15V regulator is used to protect the MOS tube and capacitor rapid reverse discharge. The approximate formula for the length of the delay is: T = 1.4RC

Seven: Network Throughput Test Report

2.4G (B/G/N) Throughput Test Fluctuation Chart:



5G (AC/A/N) Throughput Test Fluctuation Chart:



Eight: RF Test Report

2.4G RF Parameters Form (Hardware Version: 8.0)

Channel (Band)	1 （2412M）	5 (2432M)	7 (2442M)	9 (2452M)	13 (2472M)
Normal power	17.6	17.6	17.5	17.6	17.5
EVM1	-32	-32	-32	-32	-32
Enhanced power	18.6	18.8	18.7	18.5	18.6
EVM2	-30	-30	-30	-30	-29

5G RF Parameters Form (Hardware Version: 8.0)

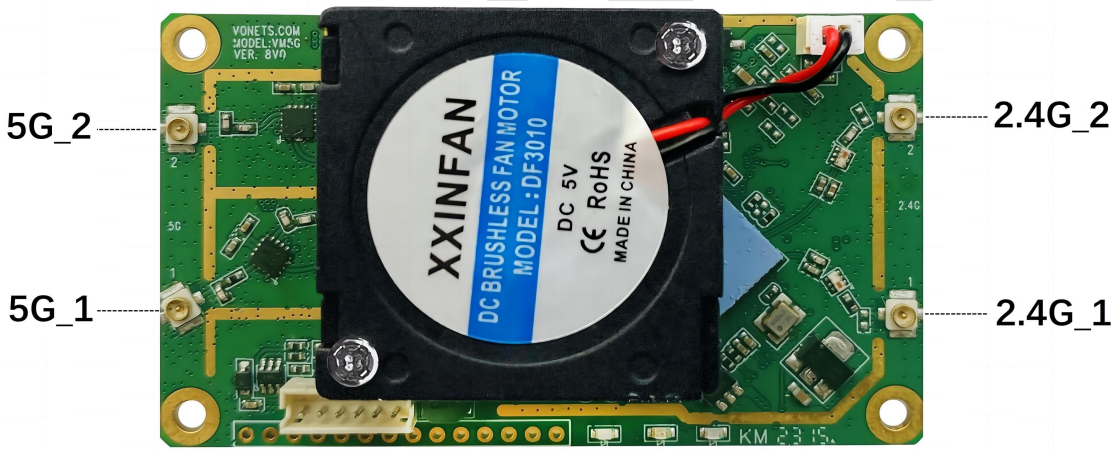
Channel(Band)	19.8	19.8	19.9	19.7	19.5	18.9
Transmit Power 1	-36	-36	-36	-36	-35	-32
EVM1	22.3	22.1	22.5	22.3	21.2	20.4
Transmit Power 2	-30	-31	-31	-31	-30	-30
EVM2	19.8	19.8	19.9	19.7	19.5	18.9

Nine : Antenna Matching Test Report:

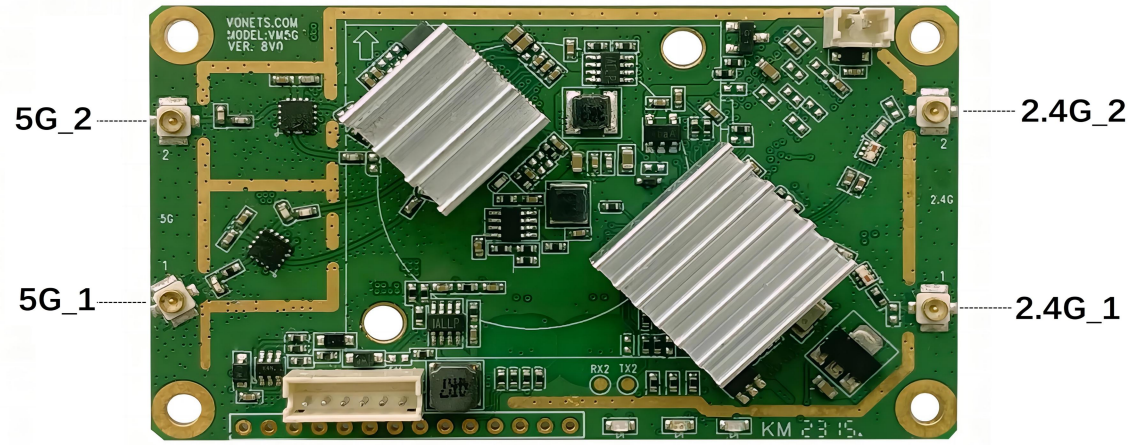
Standing Wave Ratio Parameters Form (Hardware Version: 8.0)					
Band / ANT Channel	2.412GHz	2.432GHz	2.452GHz	2.462GHz	2.477GHz
ANT1	1.38	1.41	1.39	1.39	1.39
ANT2	1.32	1.31	1.32	1.31	1.32
Band / ANT Channel	5.180GHz	5.350GHz	5.550GHz	5.700GHz	5.825GHz
ANT1	1.50	1.5	1.51	1.51	1.53
ANT2	1.61	1.60	1.63	1.61	1.64

Ten: Attachment: Product & Accessories Diagram

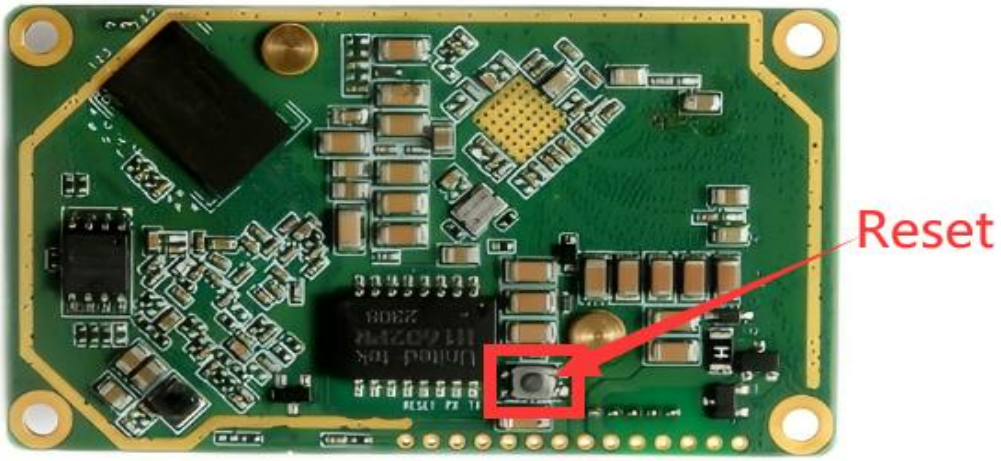
Fan model：



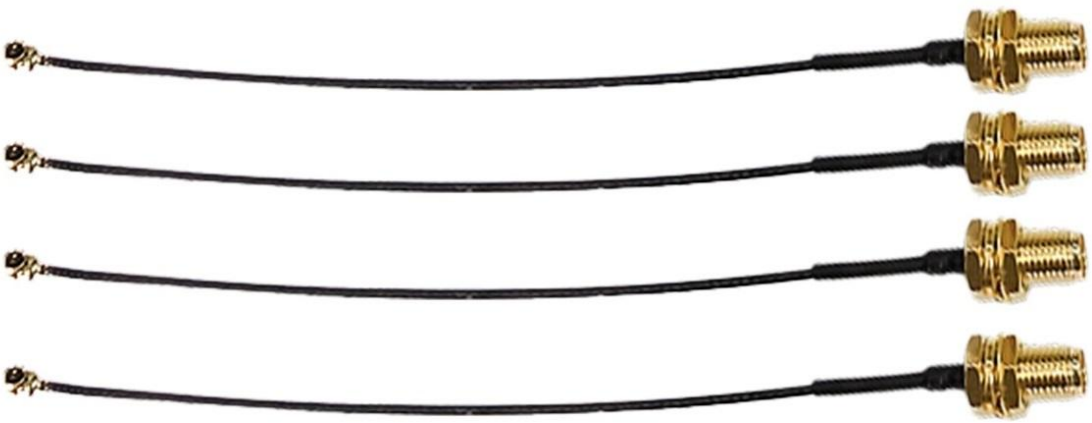
Standard model：



Reset button：



● 2*3dBi 2.4G Whip antennas; 2*3dBi 5G Whip antennas



● A professional power supply and network two-in-one dedicated cable