

## Wireless IoT Module Manual

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Version: 1.1

PART No: HE-A2

Hardware Version: A2

Version	Description	Date
1.0	Initiate Release	2014-Jul-24
1.1	Add GPIO Characteristics	2014-Nov-17

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## 1. Description

HE is a high performance, low cost 150M, 2.4G WiFi module. It is compatible with 802.11b/g/n. provide Ethernet, USB, UART and GPIOs interface. HE use small outline package, it is used widely in WiFi solutions.

HE means “core” in Chinese. Intend of HE module is to be used as the core of the IoT, WiFi solution.

HE is based on Open Source OpenWrt system. User is free to modify the software for their applications.

## 2. Specification

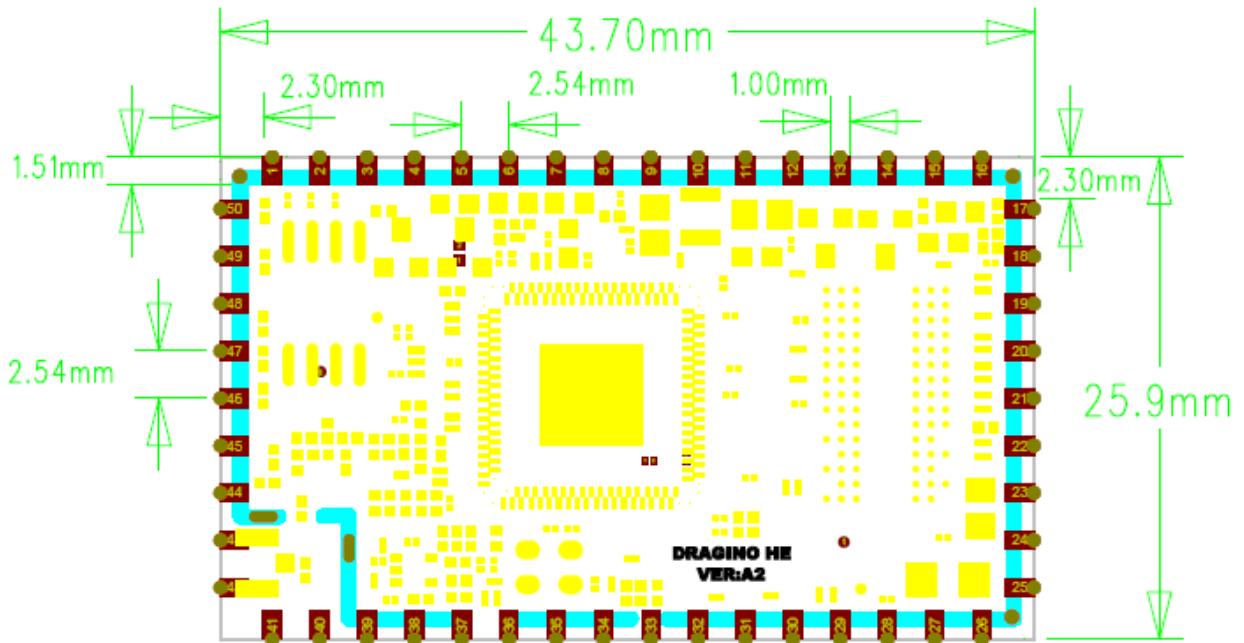
- ✓ **CPU:** ATHEROS AR9331 chipset, which integrates MIPS 24Kc processor, CPU 400MHz, Switch (MAC, PHY) and integrates with MAC, RF, PA and LNA for WiFi.
- ✓ **RAM :** 64MB;
- ✓ **Flash :** 16MB
- ✓ **Interfaces:** 2 x RJ45, 1 x USB Host, 1 x UART, 14 multiplex GPIOs
- ✓ **OS:** Open Source OpenWrt
- ✓ **Power:** 3.3v power input
- ✓ **WiFi:** Support 150M 2.4Ghz WiFi, 802.11 b/g/n
- ✓ **Frequency range:** 2.4~2.4835GHz
- ✓ **Modulation:** BPSK, QPSK, CCK and OFDM (BPSK/QPSK/16-QAM/ 64-QAM)
- ✓ **Sensitivity @PER :** 135M : -65dBm@10%PER; 65M : -65dBm@10%PER; 54M : -68dBm@10%PER; 11M : -84dBm@8% PER; 6M : -88dBm@10% PER; 1M : -90dBm@8% PER
- ✓ **Typical Distance:** Indoor: 60m (max); Outdoor 150m (max)
- ✓ **Connector:** I-PEX connector. Provide Optional ANT pin out for SMT

## 3. Applications

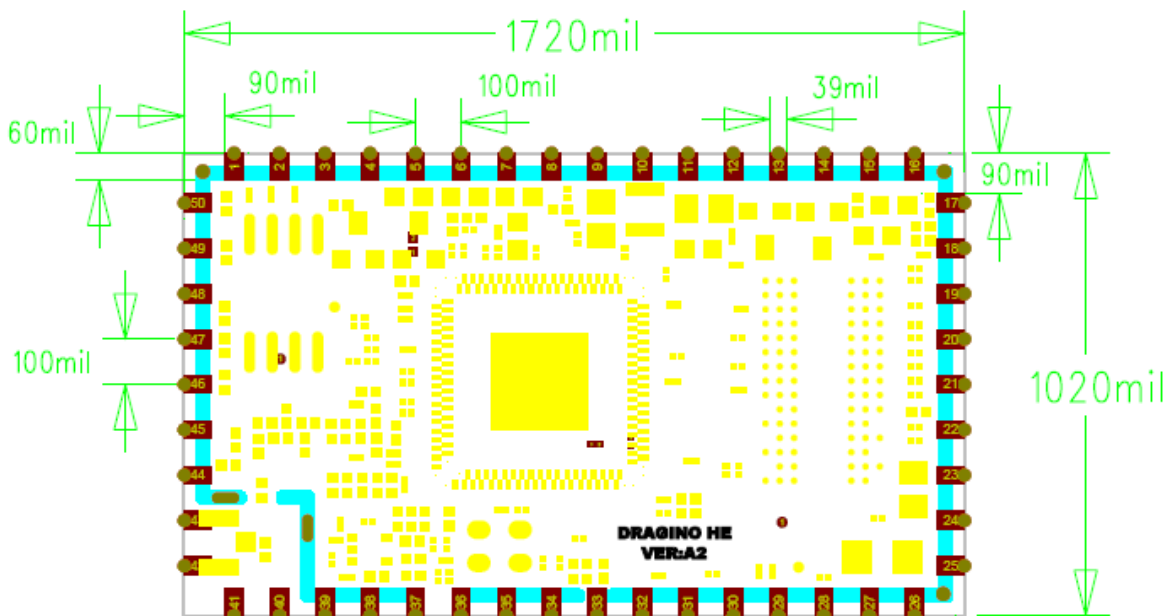
- Internet of Things
- Voice over IP
- Mesh WiFi
- Industrial Control

## 4. Dimensions and Mechanical

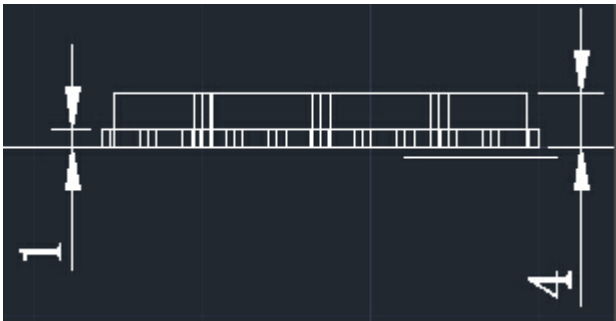
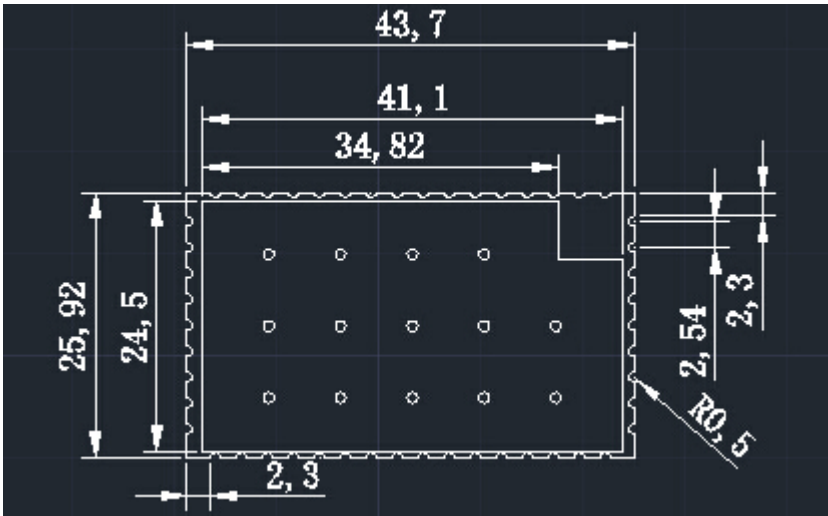
Unit: mm



Unit: mil

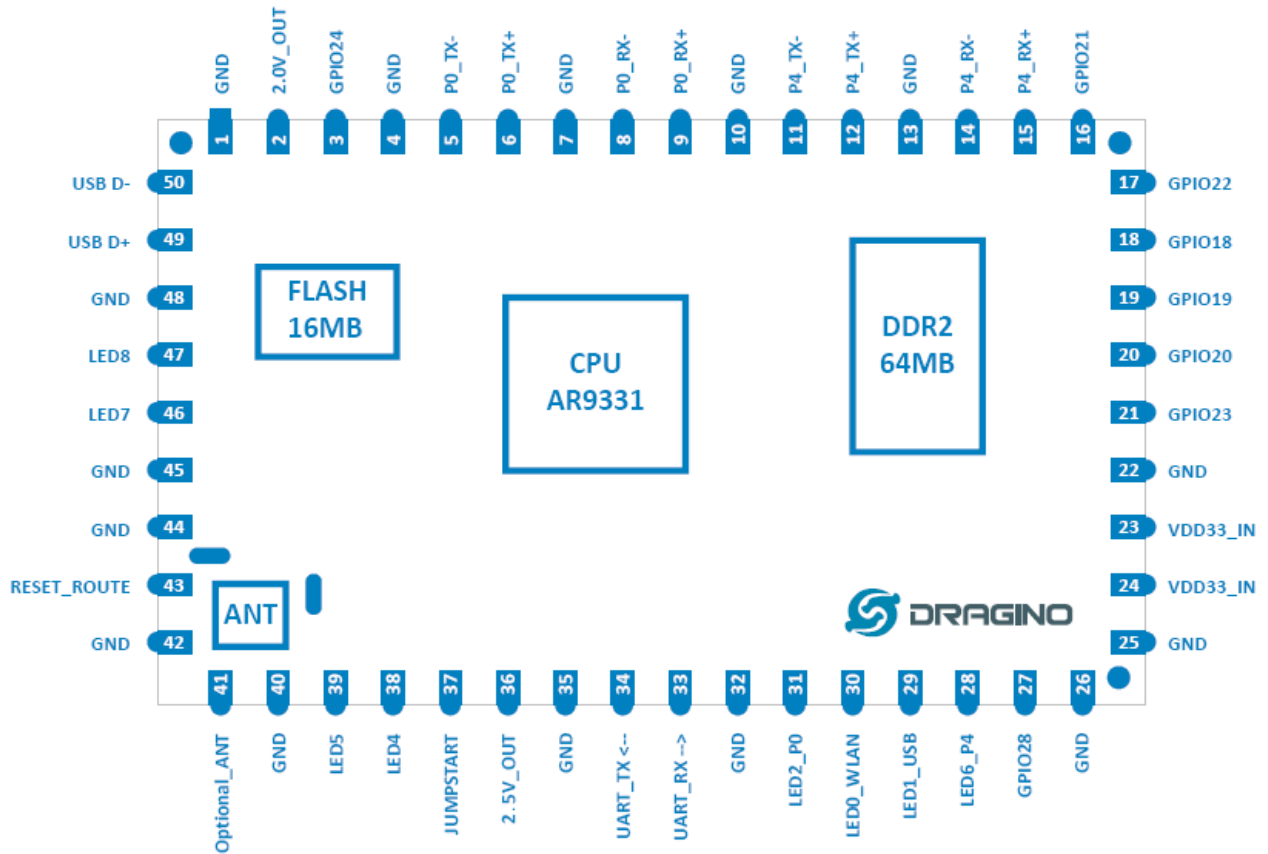


Unit:mm



## 5. Pin Definition

### 5.1 Pin Definition



Pin No.	Signal	Direction	Function	Remark
1	GND		Ground	
2	2.0V_Out	Output	2.0V output to Ethernet	
3	GPIO24	In/Out	General I/O	
4	GND		Ground	
5	P0_TX-	Out	Ethernet Port0 transmit pair	
6	P0_TX+	Output		
7	GND		Ground	
8	P0_RX-	Input	Ethernet Port0 receive pair	
9	P0_RX+	Input		
10	GND		Ground	
11	P4_TX-	Out	Ethernet Port4 transmit pair	
12	P4_TX+	Output		
13	GND		Ground	
14	P4_RX-	Input	Ethernet Port4 receive pair	
15	P4_RX+	Input		
16	GPIO21	In/Out	General I/O	
17	GPIO22	In/Out	General I/O	
18	GPIO18	In/Out	General I/O	
19	GPIO19	In/Out	General I/O	

20	GPIO20	In/Out	General I/O	
21	GPIO23	In/Out	General I/O	
22	GND		Ground	
23	VDD33_IN	Input	Power Supply, 3.3V	
24	VDD33_IN	Input	Power Supply, 3.3V	
25	GND		Ground	
26	GND		Ground	
27	GPIO28	In/Out	General I/O	
28	LED6_P4	Output	Status LED for Ethernet Port4	Should be source current only
29	LED1_USB	Output	Status LED for USB port	Should be source current only
30	LED0_WLAN	Output	Status LED for Wireless	Should be source current only
31	LED2_P0	Output	Status LED for Ethernet Port0	Should be source current only
32	GND		Ground	
33	UART_RX	Input	Serial data in	
34	UART_TX	Output	Serial data out	
35	GND		Ground	
36	2.5v_out	Output	Reference 2.5v output	
37	JumpStart	In/Out	Failsafe Control Signal, GPIO11	
38	GPIO15	In/Out	General I/O	Should be source current only
39	GPIO16	In/Out	General I/O	
40	GND		Ground	
41	Optional ANT	Output	Optional Antenna output	
42	GND		Ground	
43	RESET	Input	RESET input, active LOW	
44	GND		Ground	
45	GND		Ground	
46	GPIO27	In/Out	General I/O	
47	GPIO26	In/Out	General I/O	
48	GND		Ground	
49	USB D+		USB D+ Signal	
50	USB D-		USB D- Signal	

## 5.2 GPIO Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OH</sub>	Output High Voltage	—	2.44	—	—	V
V <sub>OL</sub>	Output Low Voltage	—	—	—	0.1	V
V <sub>IH</sub>	Input High Voltage	—	0.7	—	—	V
V <sub>IL</sub>	Input Low Voltage	—	0.3	—	—	V

Signal Name	Type	Drive	PU/PD Resistance
GPIO_0 - GPIO_28	I/O	Up to 24 mA	200 KΩ

## 5.3 Power Consumption:

Periphery	IDLE		Bulk File Transfer in all ports	
	Current @3.3v	DC Power	Current @3.3v	Power
WiFi only	150ma	495mw	220ma	726mw
RJ45 only	160ma	528mw	205ma	676mw
WiFi + 1 RJ45	210ma	693mw	282ma	924mw
WiFi + 2 RJ45	270ma	891mw	343ma	1131mw
WiFi + 2 RJ45 + USB				

## 6. Software Source

Software of HE module base on OpenWrt Linux, OpenWrt trunk source code can be used for HE.

We also provide two of customized software as a quick start.

### **Mesh IoT Firmware:**

This firmware has enhanced network support such as WiFi Mesh, 3G. It also supports the basic Arduino Bridge features and remote upgrade. Link for this firmware:

[Release Note](#)

[Source code and How to Compile](#)

### **Arduino Yun Firmware:**

This firmware is derived from the official Arduino Yun firmware with some bug fixed and support more avrs.

[Release note](#)

[Source code](#)

## 7. Antenna information

Integral antenna:

Model: ATW-102-0009-010

Manufacturer: Ante intelligent Communications(shenzhen)CO.,Ltd

Antenna gain: 1.5dBi

External antenna:

Model: AN2400-5701SM

Manufacturer: Dongguan meimei electronics factory

Antenna gain: 2dBi

Integral antenna:

Model: NB004-113B-125IX

Manufacturer: Dongguan honuo electronics co. LTD

Antenna gain: 2dBi



## 8. FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: 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.

We will retain control over the final installation of the modular such that compliance of the end product is assured. In such cases, an operating condition on the limit modular approval for the module must be only approved for use when installed in devices produced by a specific manufacturer. If any hardware modify or RF control software modify will be made by host manufacturer, C2PC or new certificate should be apply to get approval, if those change and modification made by host manufacturer not expressly approved by the party responsible for compliance, then it is illegal.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, 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 FCC ID: ZHZHE Or Contains FCC ID: ZHZHE"

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Note: 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.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, then the host can be sold legally.