

## EH-ES201

### Low Energy SiP Module Data Sheet

12 Oct 2020    Version 1.3



Professional *Bluetooth* Solution Provider

## VERSION HISTORY

Version	Comment
V1.1	First edition
V1.2	Add antenna patterns
V1.3	Updated pin descriptions

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## 1. Introduction

EH-ES201 is a low-power Bluetooth® 5 module based on Nordic nRF52 series platform. With ultra-small size and powerful features. Powered by a highly efficient 64MHz 32-bit ARM® Cortex™ M4 CPU and 192 KB Flash + 24 KB RAM.

EH-ES201 comes with a high-performance built-in antenna, which can connect up to 60m in an open environment. No external antenna is needed, and the ultra-small size of 7.0 \* 7.0 \* 1.4mm can reduce the PCB area requirements of customers' products and help customers realize ultra-small products. At the same time, the ES201 module can optionally support external antennas to meet customer requirements for antenna performance and layout in different occasions.

After purchasing EH-ES201, we will provide free technical support for the APP of the IOS system or the APP of the Android system.

## 2. Quick Specifications

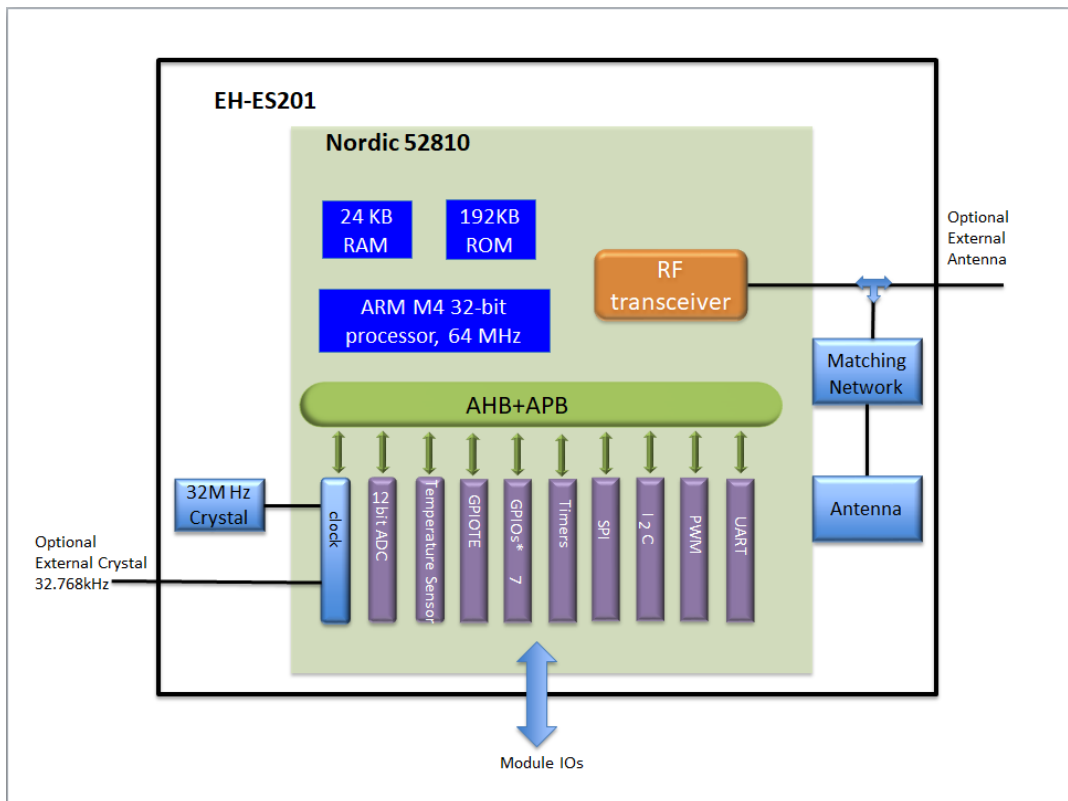
Bluetooth Version	
BLE version	Bluetooth 5 Low Energy
	Bluetooth/SIG Mesh
Radio	
Frequency	2402MHZ-2480MHZ
Transmit power	+4 to -20 dBm in 4 dB steps
Receiver sensitivity	-96dBm
Modulations	GFSK at 1 Mbps, 2 Mbps data rates
Antenna	Integrated (-1dBi peak); support onboard antenna or external antenna
OTA	Supported
Electrical Specifications	
Power supply	1.7V to 3.6V
Radio current consumption DC/DC at 3V	7.0 mA at +4 dBm TX power,
	4.6 mA at 0 dBm TX power,
	4.6 mA in RX at 1 or 2 Mbps
Radio current consumption DC/DC at 3 V	0.3 μA in System OFF, no RAM retention
	0.5 μA in System OFF, full RAM retention
	0.6 μA in System ON, no RAM retention
	0.8 μA in System ON, full RAM retention
	1.5 μA in System ON, full RAM retention and RTC
Hardware	
Dimension	7.0x7.0x1.4mm
Temperature Range	-30°C to +85°C
MCU	Highly efficient 64MHz 32-bit ARM® Cortex™ M4 CPU

Flash	192 KB Flash				
Ram	24 KB				
Interfaces	Temperature sensor	I2C	GPIO*7	UART	GPIOTE
	SPI Master-slave interface	PWM	RTC	SWD	SPI
<b>Software</b>					
Bluetooth mesh self-organizing network protocol					
Low power transmission protocol					
The Ehware's profile kit is used to develop the bluetooth 5.0 specification					

### 3. Applications

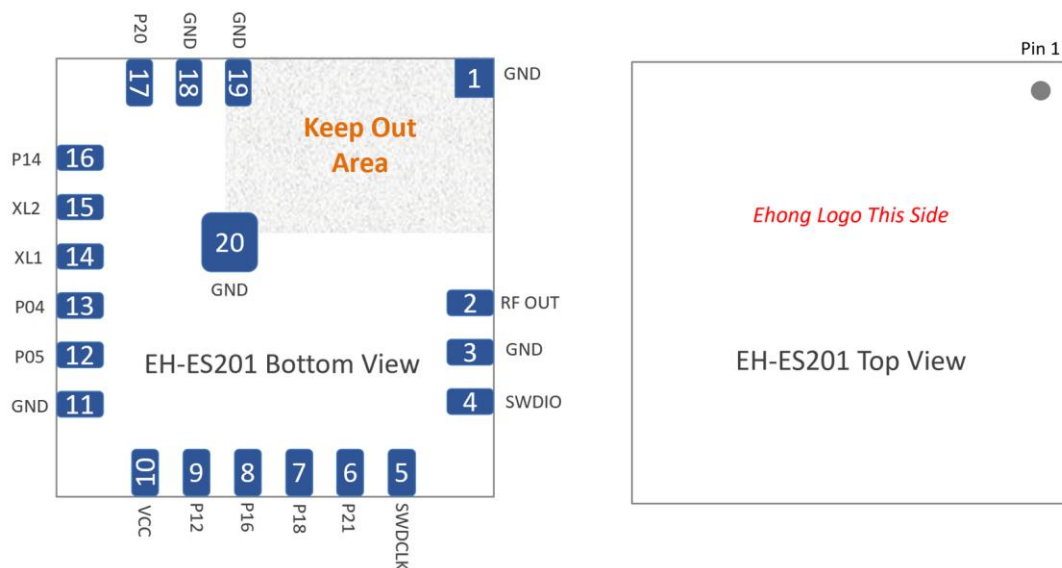
- Smart buildings, Smart cities
- Industry 4.0
- Low-Power Sensor Networks
- Fitness / Sports / Health
- Smart Home
- Smart lighting systems
- iBeacons™ / Proximity
- BLE Mesh applications
- Smart Toys / accessories
- Internet of Things
- Hotel Automation
- Office Automation

### 4. Block Diagram



## 5. Pin Descriptions

### 5.1 Pin-out



### 5.2 Pin Descriptions

Pin	No.	Function	Remark
RFOUT	1	Support external antenna	
GND	2	GND pin	Power GND
SWDIO	3	Support SWD	
SWDCLK	4	Support SWD	
P21	5	Reset	Reset
P18	6	General input/output	
P16	7	General input/output	
P12	8	General input/output	
VCC	9	1.7-3.6V	Connect a capacitor
GND	10	GND pin	Power GND
P05	11	General input/output	
P04	12	General input/output	
XL1	13	Connect external 32.768K crystal	
XL2	14	Connect external 32.768K crystal	

P14	15	General input/output	
P20	16	General input/output	
GND	17	Power GND	
GND	18	Power GND	
GND	19	Power GND	
GND	20	Power GND	

**Note:**

1 MP test points should be reserved, including UART TX, UART RX, RESET.

2 For debugging, it is recommended to keep the SWDIO and SWDCLK test points.

3 If used with MCU chip, it is recommended to connect the reset pin.

## 6. Electrical Specifications

### 6.1 7.1 Recommended Operation Conditions

Operating Condition	Min	Typical	Max	Unit
Operating Temperature Range	-30	+25	+85	°C
Storage Temperature Range	-40	+25	+85	°C
Working Voltage	1.7	+3.0	3.6	V
Voltage for module	1.8	-	3.6	V
I/O Supply Voltage (VDD_PIO)	-0.4	+3.0	+3.6	V
AIO input	0	-	VDD_BAT	V
Frequency range	2400	-	2500	MHz

**Note:** Terminal voltages other than RF

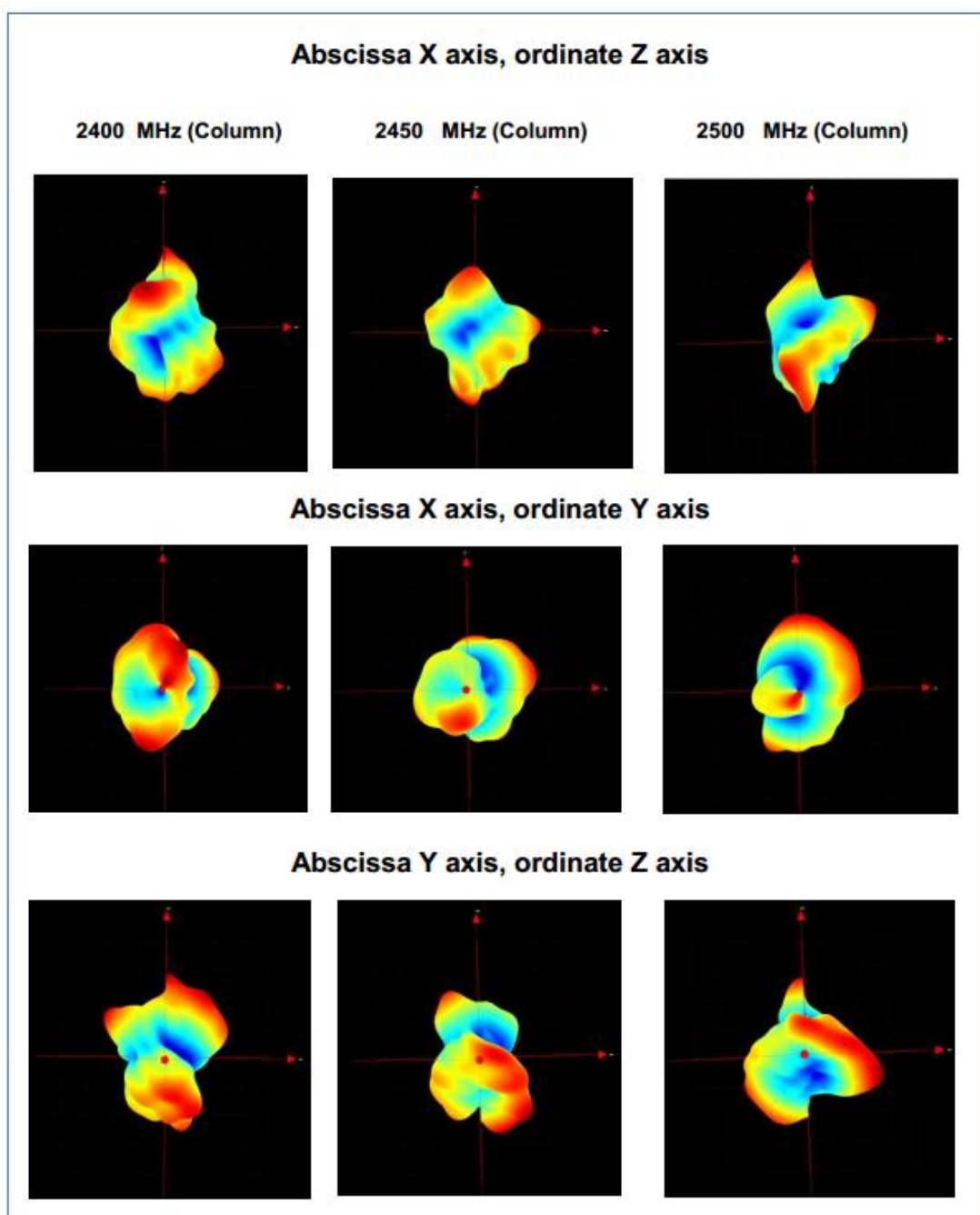
### 6.2 Module power consumption

Power mode	Current Consumption(Max)
Transmission mode (3V DC/DC )	7.0 mA, Active TX mode( TX power:4dBm)
	4.6 mA, Active TX mode( TX power:0dBm)
	4.6 mA , Active RX mode( 1M ot 2M)
Standby mode (3V DC/DC )	0.3 μA in System OFF, no RAM retention
	0.5 μA in System OFF, full RAM retention
	0.6 μA in System ON, no RAM retention
	0.8 μA in System ON, full RAM retention
System current consumption (3V DC/DC)	1.5 μA in System ON, full RAM retention and RTC

- minimum power consumption: Condition: VBAT=3V, VDDIO=3V, ambient temperature:25°C.



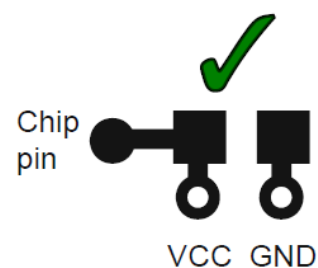




## 10. Layout suggestion

### 10.1 Power supply precautions

- Module power: 3v button battery or DC 3.3v
- Connect the power pin capacitors as close as possible to the chip and pins
- Use capacitors to decouple power from the chip
- Use capacitors to prevent noise from coupling back into the power plane



Note: When supplying power to the module, it is necessary to use a small ripple (generally, the power ripple within 30mV is sufficient). It is recommended to use the LDO to power the module when selecting the power supply. The LDO PCB layout needs to be away from some inductive sensor, DC -DC power supply \ inductance, etc., in the PCB design, it is necessary to have a reliable grounding process, and it must not exceed the maximum voltage used by the module to prevent the module from irrecoverable damage.

## 10.2 Layout Guidelines

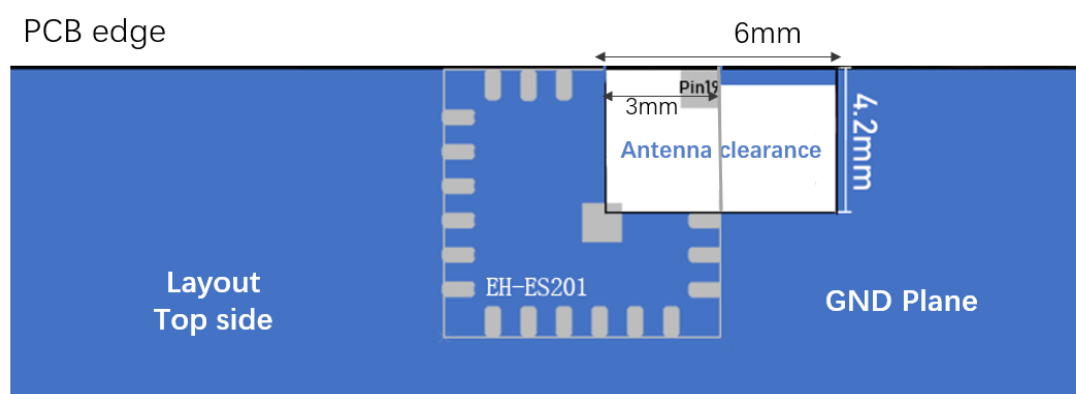
For ES201, the integrated antenna needs a proper ground plane to radiate efficiently.

The area protruding from under the antenna section of the module should be free of copper and other metals.

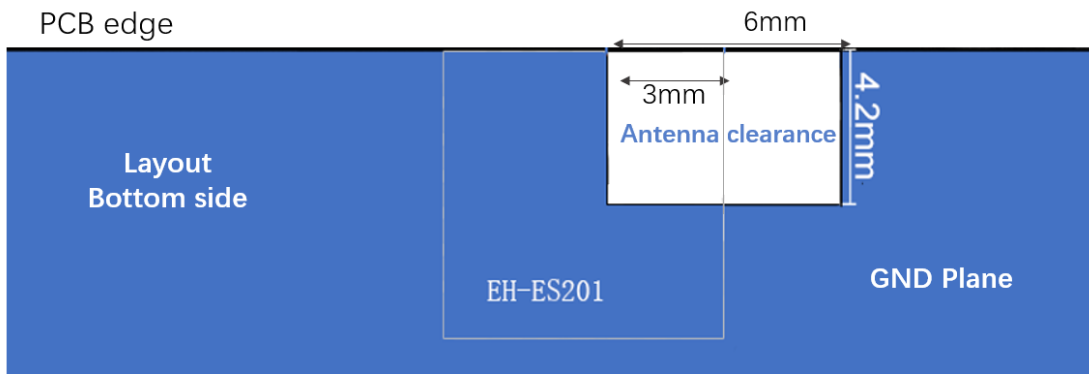
The module should be placed on the edge of the PCB with the antenna edge facing outward.

The antenna needs to be processed for clearance during layout, and requires a sufficient clearance area. (When designing, pay attention to both the top and bottom layers. If conditions allow, it is recommended to hollow out the clearance directly when designing the PCB board. No form of electrical operation is allowed in the projection area of the antenna to ensure the radiation effect of the antenna.

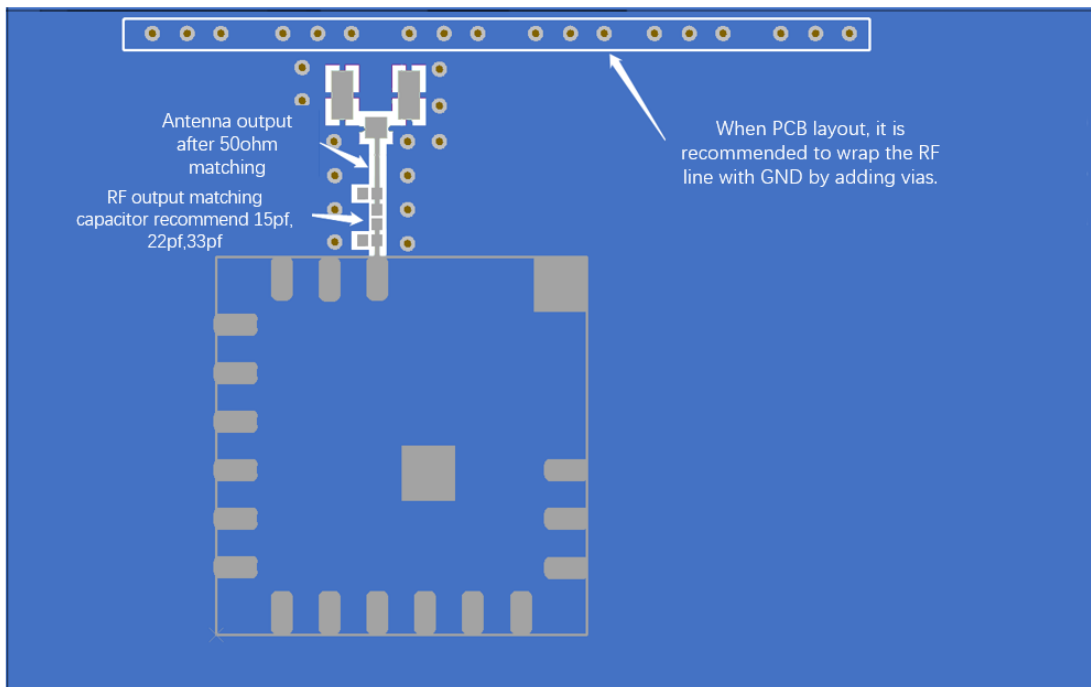
When using IPEX technology (external antenna) by yourself, please pay attention to 50 Ohm matching in the RF output part, and in the RF output part, it is recommended to use vias and ground to cover the PCB layout to prevent RF on the PCB. There is unnecessary loss during the transmission process, and the radio frequency part needs to be kept at a distance of more than 10mm from some interference source parts. Generally, it is necessary to avoid any electrical components during the layout.



**Note:** Pin19 Need to be grounded.



### 10.3 EH-ES201 PCB layout



## 11. Development Kit

EH-ES201-EVK is designed based on EH-ES201 module.

The development kit integrates LED, reset button, IO interface, SWD. There are 7 IO ports. It also has a rich interface and completeness to help customers easily complete product development and testing.



## 12.2 Packing Label

		
Customer Name	XXXX	
PO#	*****	
Material NO.	85200X	
Model	EH-XX	
Quantily	XX PCS	
Date	XX/XX/XX	
		
		

## 13. Related Documents

### Ehong Documents:

Visit website and download:

Supports: [support@ehonglink.com](mailto:support@ehonglink.com) phone: +0086 021-54769993-201

Sales: [sales@ehonglink.com](mailto:sales@ehonglink.com)