

EH-ES201

Low Energy SiP Module User Manual

19 Jan 2020 Version 1.2



Professional *Bluetooth* Solution Provider

VERSION HISTORY

Version		Comment
V1.1		First edition
V1.2		Add antenna patterns

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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.

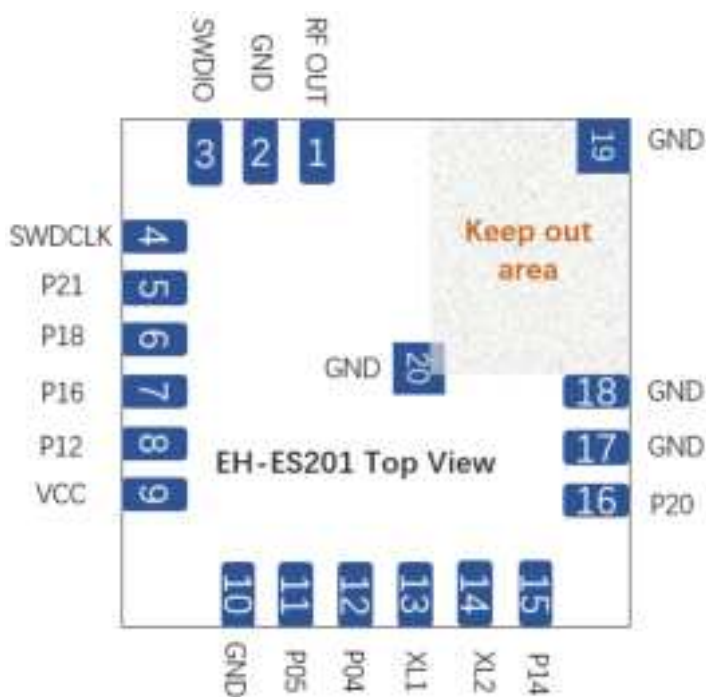
After purchasing EH-ES201, we will provide free technical support for the APP of the IOS system or the APP of the Android system.

2. 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

3. Pin Descriptions

3.1 Pin-out



3.2 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 32MHz crystal	

XL2	14	Connect external 32MHz 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.

4. Electrical Specifications

4.1 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	2402	-	2480	MHz

Note: Terminal voltages other than RF

4.2 Module power consumption

Power mode	Current Consumption(Max)
Transmission mode (3V DC/DC)	7.0 mA, Active TX mode(TX power:3.5dBm)
	4.6 mA, Active TX mode(TX power:3.5dBm)
	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

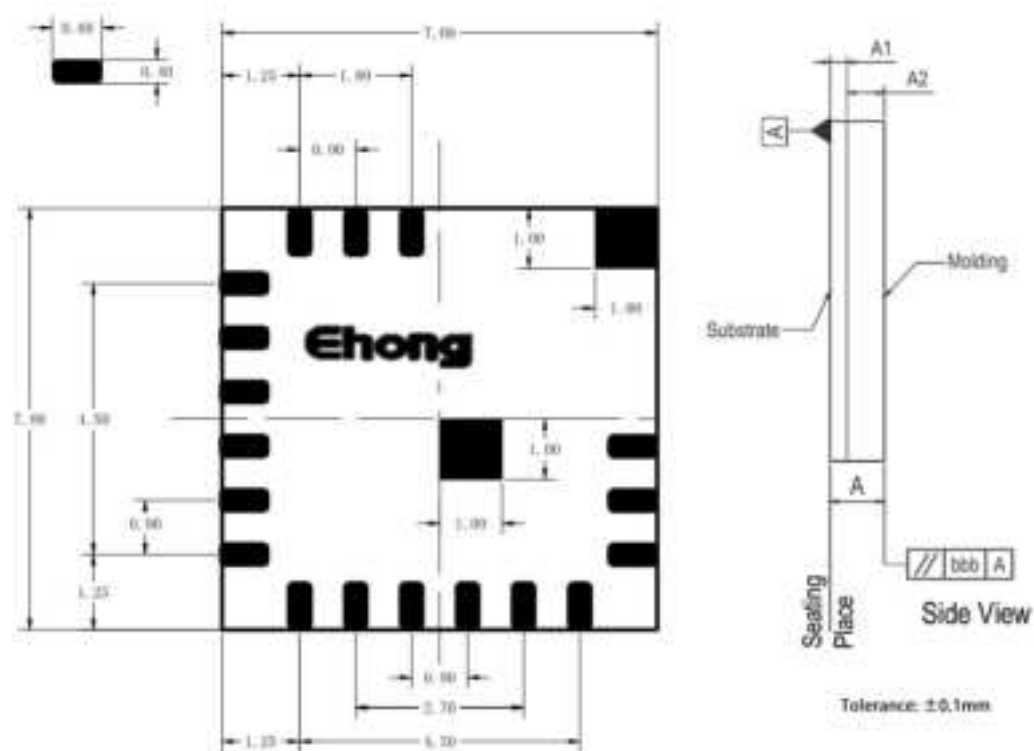
- minimum power consumption: Condition: VBAT=3V, VDDIO=3V, ambient temperature:25°C.

5. Software/ Firmware

Software Support	
Standard Software	Ehong provide module with standard software for customer to develop. Support to make some modification and support customized MAC address
SDK development	Ehong provide SDK and description

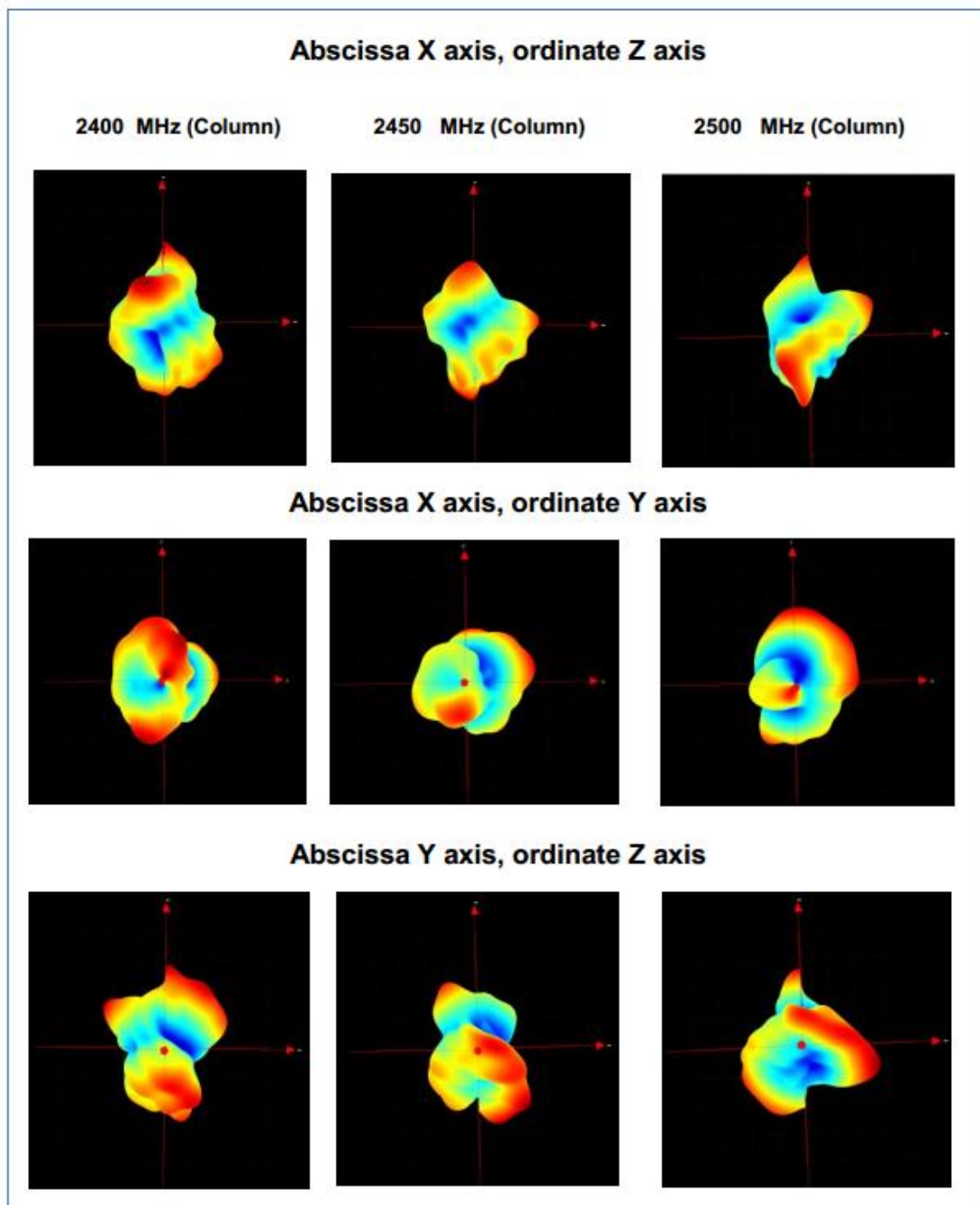
6. Mechanical Data

6.1 Dimensions and recommend PCB



7. Antenna Patterns

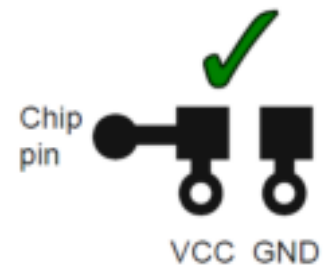
Antenna patterns are based on the EH-ES201 Evaluation Kit



8. Layout suggestion

8.1 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.

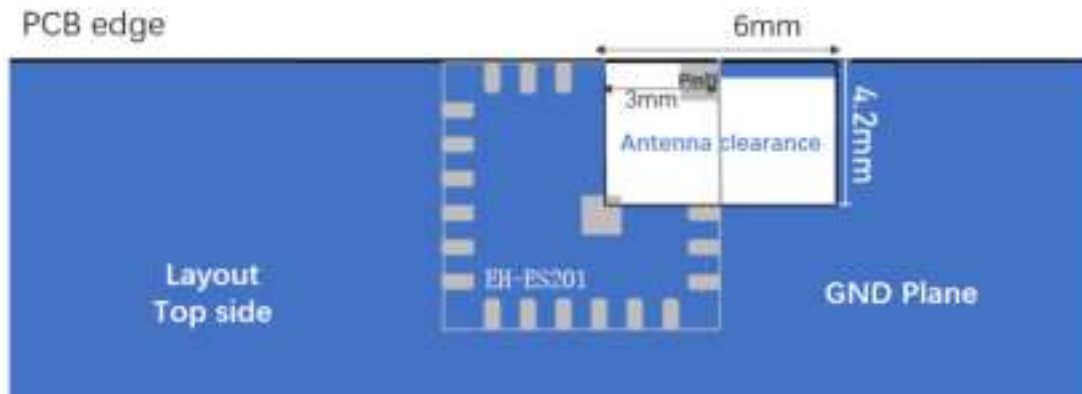
8.2 Layout Guidelines

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

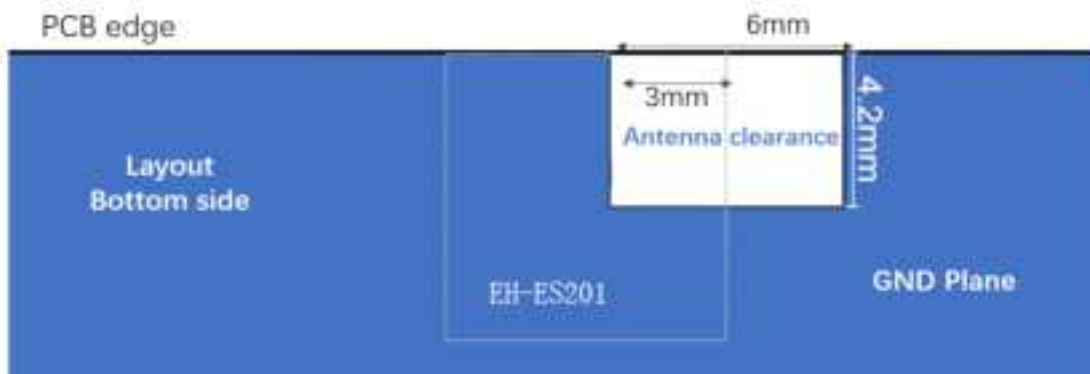
The area protruding from under the antenna section of the module should be free of copper and other metals.

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

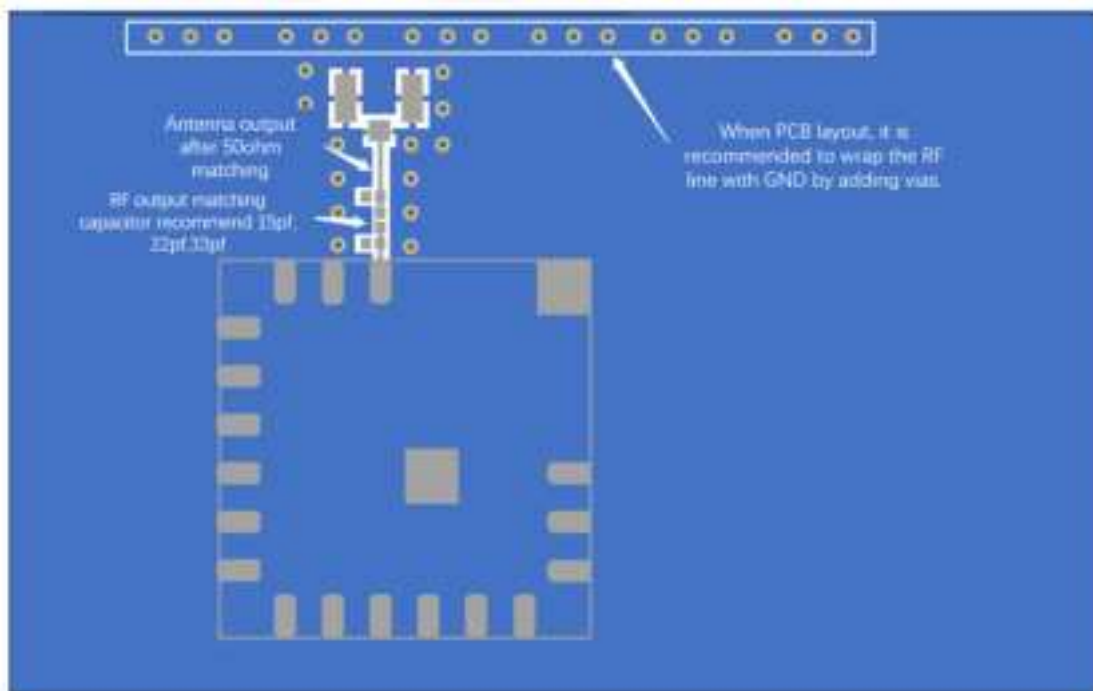
The antenna needs to be processed for clearance during layout, and requires a sufficient clearance area. (When designing, pay attention to both the top and bottom layers. If conditions allow, it is recommended to hollow out the clearance directly when designing the PCB board. No form of electrical operation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



Note: Pin19 Need to be grounded.



8.3 EH-ES201 PCB layout



9.2 Packing Label

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

10. Related Documents

Ehong Documents:

Visit website and download:

Supports: supports@ehlink.com.cn phone: +0086 021-54769993-201

Sales: sales@ehlink.com.cn

OEM Guidance

1. Applicable FCC rules

This module is granted by Single Modular Approval. It complies to the requirements of FCC part 15C, section 15.247 rules.

2. The specific operational use conditions

This module can be used in IoT devices. The input voltage to the module is nominally 1.7V-3.6 V DC. The operational ambient temperature of the module is $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$.

3. Limited module procedures

N/A

4. Trace antenna design

N/A

5. RF exposure considerations

The equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment can operated with minimum distance 5mm between the radiator and your body.

6. Antenna

Antenna type: Patch Antenna Antenna gain : 0dBi

7. Label and compliance information

An exterior label on OEM's end product can use wording such as the following: "Contains Transmitter Module FCC ID: 2ACCRES201" or "Contains FCC ID: 2ACCRES201"

8. Information on test modes and additional testing requirements

a)The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b)The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

c)If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected .

9. Additional testing, Part 15 Sub part B disclaimer The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation

When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory 50 devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

The product under test is set into a link/association with a partnering device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

FCC Warning:

Any 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

ISED RSS Warning:

This device complies with Innovation, Science and Economic Development Canada licence - exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED RF exposure statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. The device has been evaluated to meet general RF exposure requirement.

Le matériel est conforme aux limites de dose d'exposition aux rayonnements énoncés pour un autre environnement. Ce dispositif a été évalué à satisfaire l'exigence générale de l'exposition aux rf.

IC Label Instructions:

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as:

"Contains Transmitter Module IC: 20625-ES201", or "Contains IC: 20625-ES201", Any similar wording that expresses the same meaning may be used.

Instructions d'étiquetage IC: L'extérieur des produits finis contenant ce module doit afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut utiliser des libellés tels que: "contient le module émetteur IC: 20625-ES201" ou "contient IC: 20625-ES201", tout libellé similaire exprimant le même sens peut être utilisé.