



The EIoT-USBGW-MESH-NC868-USB and EIoT-USBGW-MESH-NC915-USB are intelligent USB gateways designed for wireless sensor networks operating in the 868 MHz and 915 MHz ISM bands, respectively. Leveraging the NeoMesh protocol and equipped with an external antenna, these gateways can be connected to any PC or single-board computer (SBC) via a standard USB interface. Utilizing an FTDI-based USB-UART bridge, they enable seamless communication between the host system and the NeoMesh network, effectively transforming the connected device into a NeoMesh-to-Internet gateway.

E-IoT Datasheet

EIoT-USBGW-MESH-NCxxx-USB

e-iot © Endrich R&D Hungary Kft.

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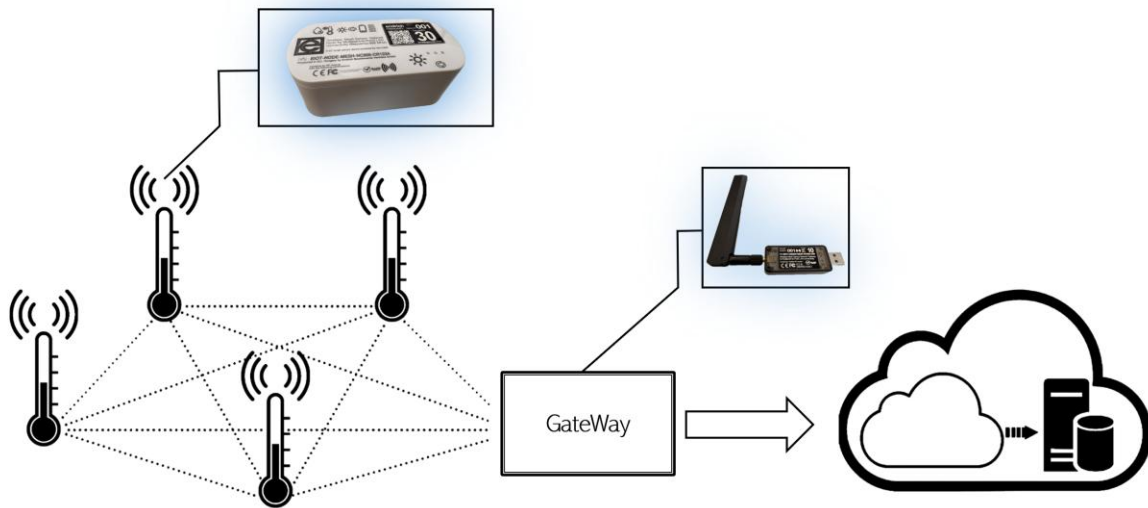
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1. Product Overview

The EIOT-USBGW-MESH-NC868-USB and EIOT-USBGW-MESH-NC915-USB are intelligent USB gateways designed for wireless sensor networks operating in the 868 MHz and 915 MHz ISM bands, respectively. Leveraging the NeoMesh protocol and equipped with an external antenna, these gateways can be connected to any PC or single-board computer (SBC) via a standard USB interface. Utilizing an FTDI-based USB-UART bridge, they enable seamless communication between the host system and the NeoMesh network, effectively transforming the connected device into a NeoMesh-to-Internet gateway.

The smart sensor network gateway node is a key component of the **Endrich E-IoT platform**, which combines intelligent sensing with low-power wireless mesh networking. At the heart of this solution is the **NeoCortec Neo.Mesh protocol**, a patented wireless communication technology optimized for **sub-GHz frequencies** (868/915 MHz), provides superior range and reliability in harsh industrial environments.



The system enables the deployment of **ultra-low-power sensor networks**, where each sensor node communicates autonomously within a **self-healing, ad-hoc mesh network**. This architecture eliminates the need for a centralized network controller, allowing **scalable and resilient communication** across thousands of nodes. Data collected by the sensors is relayed through a **local gateway**, which functions as a **LoRa/Mesh to LPWAN bridge**, and transmitted to the Cloud via **LTE-M or NB-IoT cellular networks**.

Engineered for **predictive maintenance** and **smart infrastructure applications**, this platform transforms conventional devices into fully connected IoT endpoints. The mesh protocol features **AES128 encryption**, ensuring secure and tamper-proof wireless communication. Its **synchronized sleep mode** drastically reduces power consumption, extending **battery life up to several years**, even under continuous operation.

Designed for reliability and adaptability, the system maintains connectivity even in dynamic or obstructed RF environments. New nodes can be added effortlessly to extend coverage or reinforce weak points, making it ideal for large-scale installations in **factories, commercial buildings, smart cities, and logistics facilities**.

By combining **robust communication, low energy consumption, and scalability**, this smart sensor solution is powered by Neo.Mesh provides a future-proof foundation for industrial IoT deployments.

2. Part numbering

For the easy definition of the product, a logical part numbering system has been applied according to the rules below:

Part numbering system

The E-IoT device coding defines the products developed by Endrich Group. The code structure not only identifies the product itself, but also defines its purpose, basic communication methods, and the possible power supply modes as well.

EIOT-USBGW-MESH-NCxxx-USB

Drawing Number : 001-004-003-004-005-001

PCB version

Product owner
EIOT – E-IoT product

Product type
USBGW – general-purpose USB gateway to convert a PC or SBC to NeoMesh – Internet gateway

Radio technology
MESH – NeoMesh protocol

Used RF module
NC868 – NeoMesh 868 MHz
NC915 – NeoMesh 915 MHz

Supplied power
USB

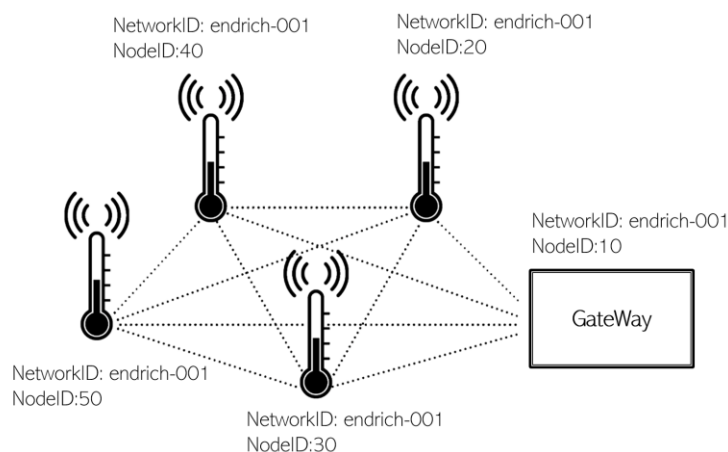
3. Technical Specifications

Wireless Communication: The smart sensor gateway uses a built-in radio module, which has been designed to comply with most national requirements for worldwide operation. The smart sensor gateways come in two versions: **EIOT-USBGW-MESH-NC868-USB**, which is intended for use in the 868 MHz frequency band, and **EIOT-USBGW-MESH-NC915-USB**, which is intended for use in the 915 MHz frequency band. The smart sensor modules and gateways share a wireless local network with a common NETWORKID, while they have a unique NODEID. See the figure in section 9 about marking and labelling the sensor gateways. The usage requires appropriate E-IoT smart sensor node devices sharing the same NETWORKID and having NODEID>10.

Operation description: The **EIOT-USBGW-MESH-NCxxx-USB** needs to be connected to one of the free USB ports of the host PC. Usually, this device will be identified by the operating system as an FTDI device, a virtual COM port. The gateway has a SAPI and an AAPI port – selectable by an onboard microswitch. In the default AAPI position, which is the usual operational mode, the gateway integrates into a wireless mesh network and repeats the messages appearing at the UART of the NC1000 module on the USB port. An appropriate software running on the host PC can detect the incoming traffic on the virtual COM port. In the SAPI mode, the host computer can access the configuration interface of the NC1000 module and can perform, e.g. a firmware update with the appropriate software.

Operational conditions:

The gateway needs one or more of the available E-IoT smart sensor devices (EIOT-NODE-MESH



NCxxx-xxx) to operate in a way to send data to one of the available Cloud services. The gateway device shares the same NETWORKID with all the nodes within the same network. The user can operate a large number of nodes in one network, providing them with unique NODEIDs, and can also operate several networks in the same physical location as long as their NETWORKIDs are different.

Electrical Characteristics

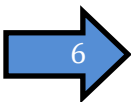
The power source

The device is powered via the USB communication port by 5V DC.

The RF parameters of the communication module:

The integrated RF module is based on **NeoCortec's NC1000 series**, designed specifically for **ultra-low-power, license-free sub-GHz communication**. Operating in both **868 MHz and 915 MHz ISM bands**, the module supports reliable mesh networking through the **NeoMesh protocol**. It features a **programmable transmit power range from -30 dBm to +10 dBm**, and a **receiver sensitivity of up to -94 dBm**, enabling long-range and robust connectivity. The module complies with **ETSI (EN 300 220/328)** and **FCC Part 15** standards, and incorporates **advanced RF filtering and spurious emission control**, ensuring optimal performance and regulatory compliance.

Parameter	Min	Typ	Max	Unit	Condition
Receiver sensitivity	-94	-93		dBm	868MHz and 915MHz, 1% packet loss
Saturation		-16		dBm	
Spurious emissions (conducted)					50 Ω single-ended load
25 MHz - 1 GHz			-57	dBm	Complies with EN 300 328, EN 300 220 class 2, FCC CFR47, Part 15, ARIB STD-T-66
Above 1 GHz			-47	dBm	
Output power (max)	+10			dBm	Delivered to 50 Ω load via U.FL connector
Output power (min)	-30			dBm	Delivered to 50 Ω load via U.FL connector
Radiated harmonics					
2nd harmonic, 868MHz			-55	dBm	@+10dBm output
3rd harmonic, 868MHz			-54	dBm	@+10dBm output
Conducted harmonics					
868MHz			-35	dBm	@+10dBm output
915MHz			-34	dBm	@+10dBm output



Spurious emissions radiated (harmonics excluded)					+10 dBm CW output
868MHz: Below 1GHz			-56	dBm	
868MHz: Above 1GHz			-54	dBm	
868MHz: 47-74 MHz			-56	dBm	
868MHz: 87.5-118 MHz			-56	dBm	
868MHz: 174-230 MHz			-56	dBm	
868MHz: 470-862 MHz			-56	dBm	
915MHz: Below 1GHz			-51	dBm	
915MHz: Above 1GHz			-60	dBm	

▪ The antenna

To ensure optimal RF performance, the module integrates a **high-efficiency external antenna** equipped with a **reverse polarity SMA connector** to prevent accidental misuse with incompatible antenna types. The antenna operates in both the **868 MHz and 915 MHz ISM bands**, making it ideal for global mesh network applications.

Manufactured as the **2JW0915-C952B**, this high-performance antenna delivers:

- **Peak gain of ~2.9 dBi (868 MHz) and ~3.0 dBi (915 MHz)**
- **Radiation efficiency of ~73.2% (868 MHz) and ~82.3% (915 MHz)**
- **VSWR** of approximately **1.4:1**
- **Return loss** better than -15 dB across both bands

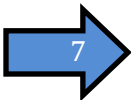
Its **linear polarization** and **omnidirectional (spherical) radiation pattern** ensure reliable, consistent coverage even in challenging installation environments. The antenna is **ground-plane independent** and **hinged**, allowing flexible positioning in confined spaces.

All RF measurements were performed in a **certified CTIA 3D anechoic chamber**, ensuring dependable performance in real-world conditions. The antenna is compliant with **RoHS** standards and supports technologies like **NeoMesh** perfectly.

Antenna and electrical specifications:

Parameter	868 MHz	915 MHz	Unit	Notes
Frequency Range	863–870	902–928	MHz	ISM bands
Peak Gain	2.9	3.0	dBi	Measured in certified 3D chamber
Efficiency	73.2	82.3	%	Radiation efficiency

Technical Datasheet for **EIOT-USBGW-MESH-NCxxx-USB**



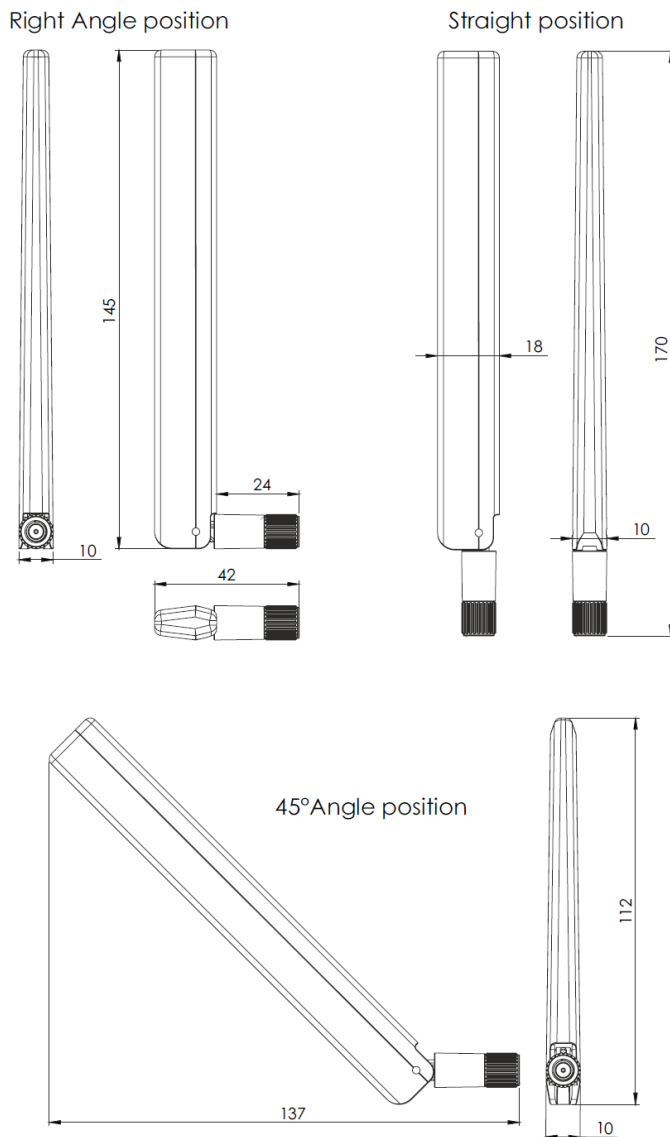
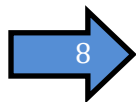
VSWR	1.4:1	1.4:1		Low standing wave ratio
Return Loss	< -15	< -15	dB	Impedance matching
Impedance	50	50	Ohm	Nominal
Polarization	Linear	Linear		Consistent with IoT modules
Radiation Pattern	Omnidirectional	Omnidirectional		Spherical pattern

4. Mechanical Specifications

Dimensions (without antenna): 70 mm x 25 mm x 16mm (width, length, height)

Net Weight (w/o antenna): 15 gr

Antenna dimensions:



5. Environmental Ratings

- Operating/Storage Temperature: -20 °C to +85 °C
- IP Rating: IP51

6. Regulatory Compliance (UNDER APPROVAL)

The used RF module has been CE (RED), FCC certified under FCC ID: 2AB76NC1000C1

7. Software Architecture and Operating Modes

Each NeoMesh USB gateway is equipped with dedicated firmware whose primary purpose is to manage the NeoMesh communication protocol and to transparently forward received data packets to the connected host system via the USB-UART interface. Unlike sensor nodes, the gateway firmware is deliberately minimal and does not perform any application-level processing, sensor data interpretation, or cloud communication. The gateway acts as a transparent bridge between the NeoMesh wireless network and an external system—such as a PC, single-board computer (SBC), or industrial controller—connected via USB. All incoming mesh data packets are encapsulated and transmitted over the UART stream without modification, allowing full control and flexibility on the host side. To make practical use of the data, an external host application is required. This application is responsible for:

- Interpreting the received NeoMesh payloads,
- Extracting and processing sensor or status information,
- Managing time synchronization, buffering, or event handling (if needed),
- And ultimately forwarding the data to a cloud platform or local storage system for visualization, analysis, or triggering of actions.

This division of responsibilities allows the gateway to remain firmware-stable and network-focused, while offloading computational tasks and cloud connectivity to an external software layer that can be easily updated or customized to meet specific application needs.

Message Format: Node to Gateway (Downlink)

Each node communicates via **payload-based data frames**, which are handled by an **EIOTgateway** (e.g., this device). The gateway is responsible for parsing, buffering, and **forwarding messages to the cloud backend**.

General Uplink Packet Structure:

Field	Size	Description
0x52	1 byte	Packet type: Received Host Data
Payload Length	1 byte	Number of bytes in the following payload
Payload	N bytes	Application-specific data (e.g. sensor)

Example Payload Formats per Mode:

- **Digital Temperature/Humidity Mode**
preId + (temperature) [2 bytes value] + (humidity) [2 bytes value]

- **Analog Mode (ALS,Temp,Magnetic)**

[3 bytes value] + [2 bytes (magnetic)counter value] +[2 bytes ADC1 value] + [2 bytes ADC2 value] + [2 bytes ADC3 value] +[2 bytes ADC4 value]

Message format for RSSI Discovery Mode Nodes

Field	Size	Description
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0x10	1 byte	Discovery packet type
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Node1 ID	2 bytes	Originating node
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RSSI	1 byte	Signal strength in dBm
------	--------	------------------------

Node2 ID	2 bytes	Originating node
----------	---------	------------------

RSSI	1 byte	Signal strength in dBm
------	--------	------------------------

Node3 ID	2 bytes	Originating node
----------	---------	------------------

RSSI	1 byte	Signal strength in dBm
------	--------	------------------------

Node4 ID	2 bytes	Originating node
----------	---------	------------------

RSSI	1 byte	Signal strength in dBm
------	--------	------------------------

Node5 ID	2 bytes	Originating node
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RSSI	1 byte	Signal strength in dBm
------	--------	------------------------

Node6 ID	2 bytes	Originating node
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RSSI	1 byte	Signal strength in dBm
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Message Format: Gateway to Node (Uplink)

Only specific node profiles (e.g., RGB LED mode) support **downlink messages**. These are sent **via this EIOT gateway** and relayed through the mesh to the addressed node.

RGB LED Control Message Format

The node receives commands in the following binary structure:

Field	Size	Description
-------	------	-------------

 Field Size Description

0x03 1 byte Command Start Byte (Control Command)

Node ID 2 bytes Target node address

Color 1 byte RED/GREEN/BLUE On/Off variations

The RGB LED firmware interprets the command and sets the LED color accordingly.

Firmware Deployment and Updates

NeoCortec module-based gateways are factory-programmed with a firmware image matching the selected **application profile**. Firmware updates and mode changes are supported via:

- **UART configuration interface** during initial provisioning

Firmware modularity ensures that only necessary message parsers are loaded, thereby optimizing **memory footprint, power consumption, and bandwidth usage**.

8. Application Examples

- Indoor air quality monitoring
- Industrial and building automation
- HVAC systems
- Smart agriculture and greenhouses
- Smart lighting systems
- Environmental monitoring
- Indoor and outdoor daylight sensing
- Energy-efficient building automation
- Display backlight dimming (phones, TVs, monitors)
- Door and trunk closure detection
- HVAC monitoring
- Remote weather stations
- Smart building automation
- Predictive maintenance of machinery

10. Revision History

Revisions		
Date	Responsible person	Subject of the change
2025.05.30	Zoltán Kiss	Adding the hardware section
2025.07.24	Zoltán Kiss	Adding labeling, Block Diagram, and FCC warning
2025.07.30	Zoltán Kiss	Extracting labeling and Block diagram to an external document, extended with CE RED warning
2025.07.31	Zoltán Kiss	Adding FCC ID
2025.08.14	Zoltán Kiss	Adding output power (CE)

11. Compliance Logos / FCC & CE caution



FCC Caution:



Product's FCC ID: **2BRCKENGWN9000101**

Part 15.21

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

Part 15.19

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.

Part 15.105

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.
3. Body operation; this device was tested for typical body operations kept 5mm for body . To maintain compliance with RF exposure requirements.

CE RED Warning:

1. The operating temperature of the EUT can't exceed 85°C and shouldn't be lower than -40°C.

Hereby, **Endrich Bauelemente Vertriebs GmbH** declares that this product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.



RF Function	Frequency bands	Maximum output power
SRD (MSK)	863.8-869.2MHz	12,30 dBm (ERP)
SRD (GFSK)	863.3-869.7MHz	12,30 dBm (ERP)