EBYTE E220-400T22D

EBYTE E220-400T22D LoRa Wireless Module User Manual

Model: E220-400T22D
Brand: EBYTE

1. Introduction

The E220-400T22D is a cutting-edge LoRa spread spectrum wireless serial port module (UART) developed by EBYTE, based on the high-performance LLCC68 chip. This module offers versatile transmission methods and operates within the 410.125MHz to 493.125MHz frequency band, with a default operating frequency of 433.125MHz. It provides TTL level output, ensuring compatibility with both 3.3V and 5V IO port voltages, making it suitable for a wide range of applications requiring long-distance, low-power wireless communication.

Image: The EBYTE E220-400T22D LoRa wireless module, showcasing its compact design and SMA antenna connector. This module is engineered for robust, long-range wireless data transmission.

For more information, visit the official website: www.cdebyte.com

2. Key Features

- **Communication Key:** Users can set a unique communication key, enhancing data confidentiality as it cannot be read externally.
- **LBT (Listen Before Talk) Function:** Monitors the channel environment for noise before transmission, significantly improving communication success rates in challenging environments.
- **RSSI (Received Signal Strength Indicator):** Provides signal strength information, useful for evaluating signal quality, optimizing network performance, and ranging applications.
- **Air Wake-up:** Supports ultra-low power consumption through air wake-up functionality, making it ideal for battery-powered applications.
- **Multiple Transmission Modes:** Supports point-to-point transmission, broadcast transmission, and channel sense capabilities.
- **Deep Sleep Mode:** Achieves extremely low power consumption of approximately 5uA in deep sleep mode.

- **Integrated PA+LNA:** Built-in Power Amplifier (PA) and Low Noise Amplifier (LNA) enable a communication distance of up to 5km under ideal conditions.
- **Parameter Retention:** All configured parameters are saved automatically after power-off and are restored upon power-on.
- **Efficient Watchdog:** Features an efficient watchdog design that automatically restarts the module in case of an exception, ensuring continuous operation.

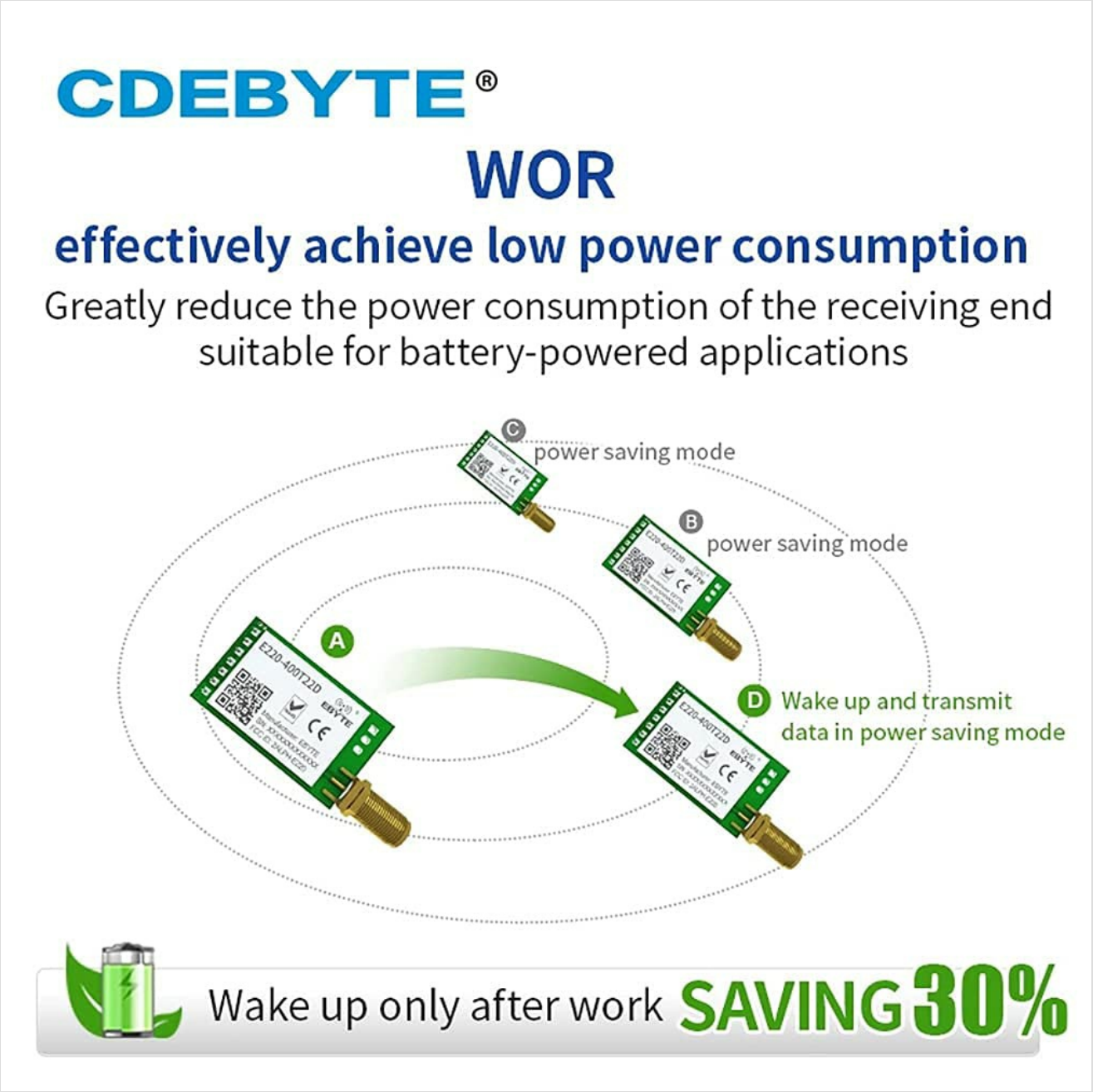


Image: Diagram illustrating the Wake-On-Radio (WOR) power-saving mode, where the module intelligently wakes up only when needed, significantly reducing power consumption for battery-powered applications.

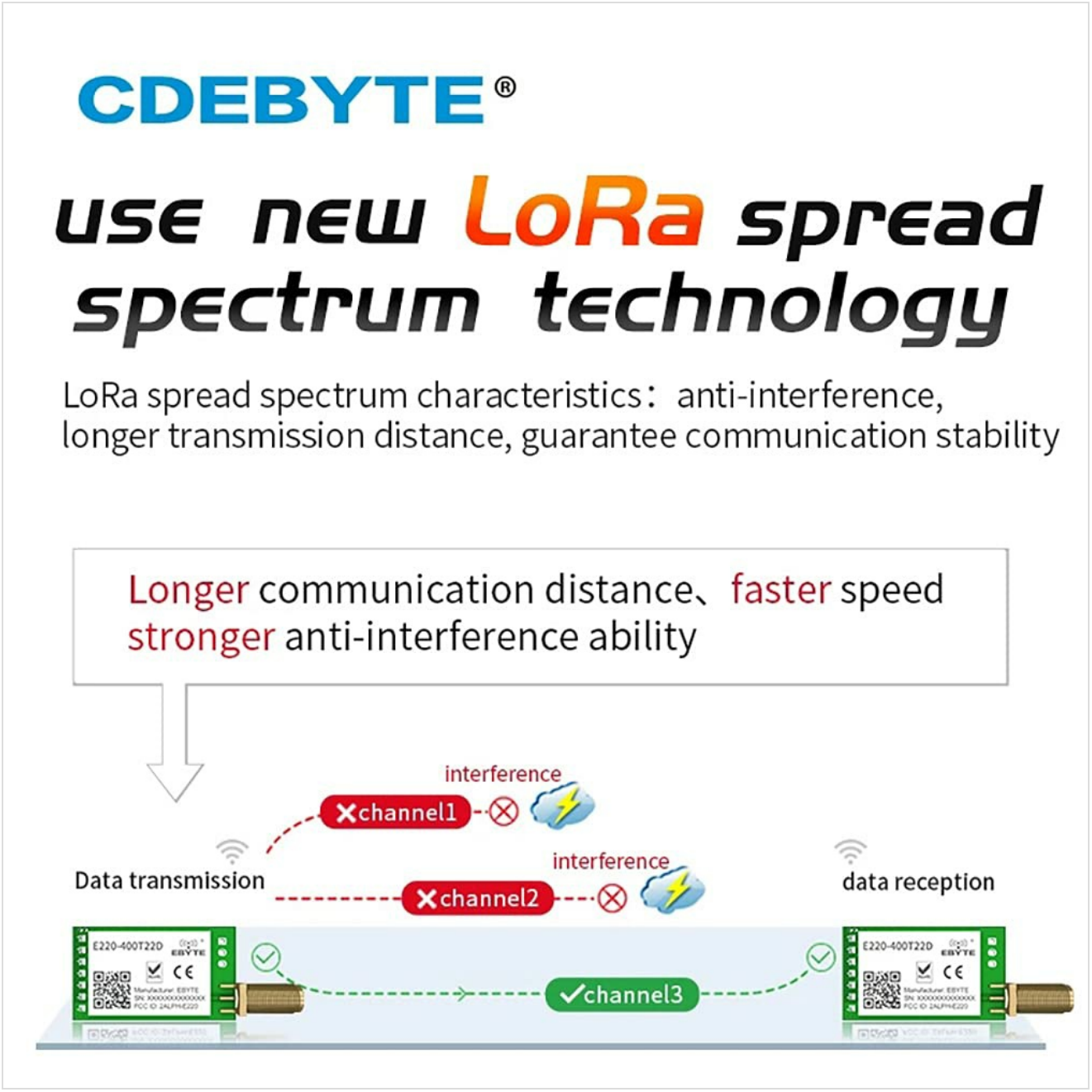


Image: Visual representation of LoRa spread spectrum technology, highlighting its anti-interference capabilities and ability to achieve longer communication distances and faster speeds by utilizing multiple channels.

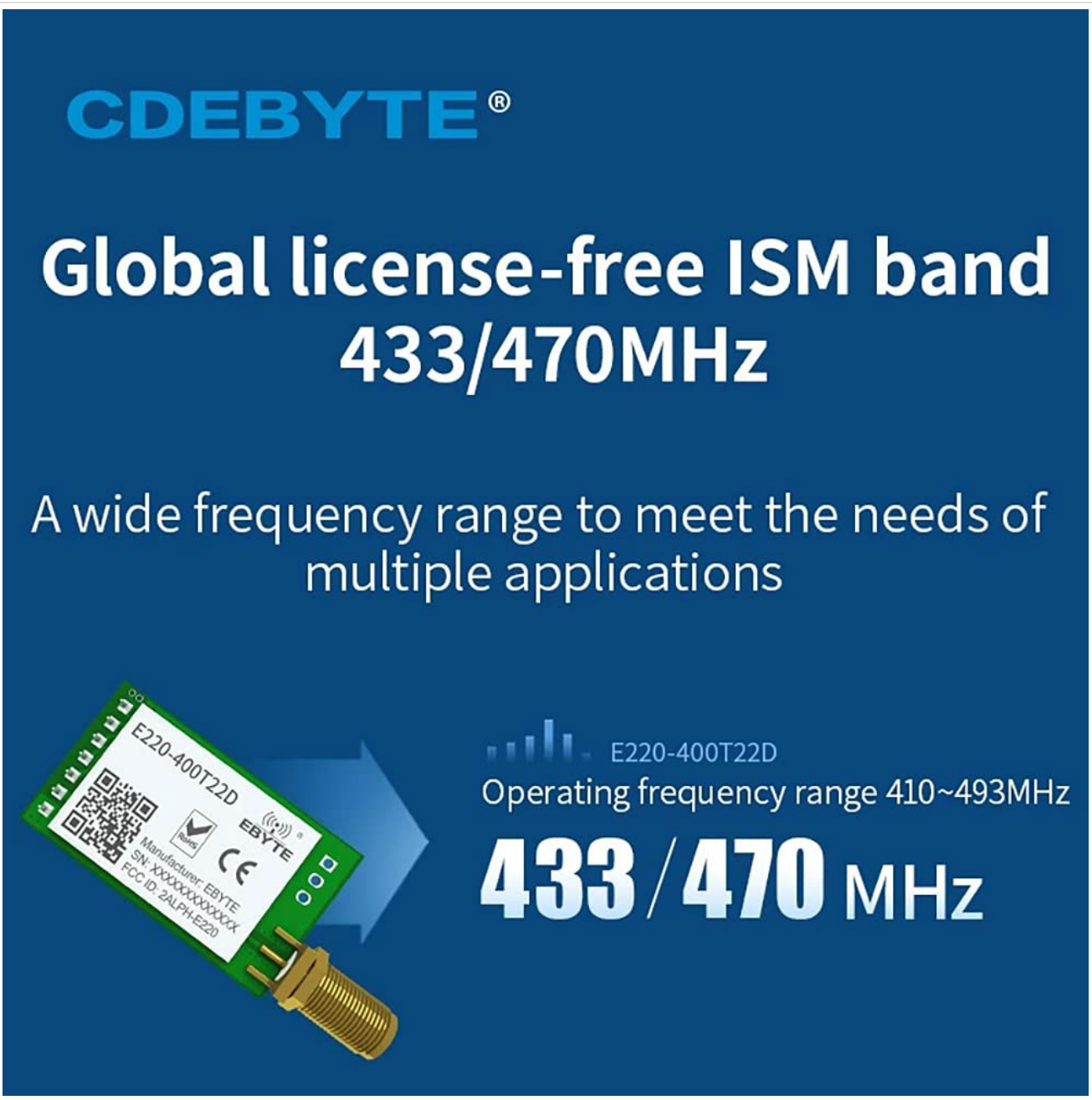


Image: Display of the global license-free ISM band for the module, operating at 433/470MHz, with an operating frequency range of 410-493MHz, suitable for diverse applications.

Image: Comparison table showcasing the superior performance of the LLCC68 chip used in the module against SX1278/SX1276 chips, particularly in terms of communication distance, data rate, and sleep power consumption.

3. Specifications

Main Parameter	Performance	Remarks
Operating frequency (MHz)	410.125~493.125	Support ISM band
Power supply (V)	3~5.5	Voltage over 5.5V will cause permanent damage to module
TX power (dBm)	22	-
Distance for reference (km)	5	Under ideal conditions
Size (mm)	21*36	-
Receiving sensitivity (dBm)	-127	-
Communication level (V)	3.3	-
Data rate LoRa (bps)	2.4k~62.5k	-
Modulation	LoRa	-
Buffer (Byte)	400	-
Package	DIP	-
TX length (Byte)	200	-
Communication interface	UART	TTL level
Antenna	SMA-K	50 ohm impedance

Image: Detailed dimensions of the EBYTE E220-400T22D module, showing its length of 36mm and width of 21mm, crucial for integration into various electronic projects.

For more information, visit the official website: www.cdebyte.com

4. Setup Guide

4.1. Pin Definitions

Refer to the module's official datasheet for a comprehensive pinout diagram and detailed descriptions of each pin. Ensure correct connection of power (VCC, GND), serial communication (TXD, RXD), and any auxiliary control pins (e.g., AUX, M0, M1).

4.2. Power Supply

Connect a stable DC power supply within the specified range of 3.0V to 5.5V. It is critical to avoid exceeding 5.5V, as overvoltage can cause permanent damage to the module. A regulated power source is recommended for optimal performance.

4.3. Antenna Connection

Attach a 50-ohm impedance antenna to the SMA-K connector on the module. For best results, use an antenna specifically designed and tuned for the 433MHz or 470MHz frequency band to maximize communication range and efficiency.

4.4. UART Connection

Connect the module's UART (Universal Asynchronous Receiver/Transmitter) pins (TXD and RXD) to your microcontroller, single-board computer, or other host device. Verify that the logic levels are compatible (3.3V or 5V TTL) to prevent damage and ensure proper data exchange.

5. Operating Instructions

5.1. Basic Communication

To initiate communication, configure the module's operational parameters such as operating frequency, air data rate, and transmit power. This can typically be done via AT commands sent through the UART interface or using dedicated configuration software provided by EBYTE.

To send data, transmit your data payload to the module's RXD pin via UART. The module will automatically handle the LoRa modulation, packetization, and wireless transmission. For receiving data, monitor the module's TXD pin; incoming LoRa packets will be demodulated and output as serial data.

5.2. Advanced Features

- **LBT (Listen Before Talk):** Enable LBT to allow the module to sense the channel for activity before transmitting, reducing collisions and improving reliability in shared spectrum environments.
- **RSSI (Received Signal Strength Indicator):** Utilize the RSSI value to gauge the strength of received signals. This is invaluable for optimizing antenna placement, assessing link quality, and performing basic ranging.
- **Air Wake-up:** Configure the module to enter a low-power sleep state and wake up only upon receiving a specific preamble from another module. This feature is crucial for extending battery life in remote applications.
- **Communication Key:** Implement a user-defined communication key to encrypt data transmissions, ensuring secure and private communication between modules.
- **Deep Sleep Mode:** For maximum power conservation, activate deep sleep mode. In this state, the module consumes minimal current (approx. 5uA), making it suitable for applications with extremely strict power budgets.

6. Maintenance

The E220-400T22D module is designed for long-term, reliable operation and generally requires minimal maintenance. Adhering to the following guidelines will help ensure its longevity and optimal performance:

- **Environmental Conditions:** Operate and store the module in a dry, clean, and dust-free environment. Avoid exposure to extreme temperatures, high humidity, or corrosive substances. The industrial standard design supports operation from -40°C to +85°C.
- **Power Supply Stability:** Ensure the power supply connected to the module is stable and within the specified voltage range (3.0V to 5.5V). Voltage fluctuations or overvoltage can lead to module damage.
- **Physical Protection:** Protect the module from physical shock, vibration, and electrostatic discharge (ESD). Handle the module by its edges to avoid touching sensitive components.
- **Antenna Connection:** Periodically check that the antenna is securely connected to the SMA-K interface. A loose connection can degrade performance.
- **Heat Dissipation:** While designed for efficiency, if the module is continuously operating at its maximum transmit power, ensure adequate airflow or heat dissipation to prevent overheating.

7. Troubleshooting

7.1. No Communication

- **Power Check:** Verify that the module is powered correctly within the 3.0V-5.5V range and that the power supply is stable.
- **UART Connection:** Double-check the TXD and RXD connections. Ensure they are not swapped and that the baud rate and other serial parameters (parity, stop bits) match between the module and the host device.
- **Antenna:** Confirm the antenna is properly connected and is suitable for the operating frequency.
- **Module Mode:** Ensure the module is not in deep sleep, configuration mode, or any other non-operational state if active communication is expected.

7.2. Short Communication Distance

- **Antenna Quality & Placement:** Use a high-gain, correctly tuned antenna. Ensure the antenna is positioned optimally, away from obstructions and metal surfaces.
- **Obstacles & Environment:** Minimize physical obstructions (e.g., walls, buildings, dense foliage) between the communicating modules. LoRa performance is affected by line-of-sight.
- **Interference:** Identify and mitigate sources of electromagnetic interference in the operating environment. Utilizing the LBT function can help in noisy environments.
- **Transmit Power:** Verify that the module is configured for its maximum transmit power (22dBm) if long distance is required.

7.3. Module Not Responding

- **Power Cycle:** Perform a power cycle by disconnecting and reconnecting the power supply to the module.
- **Watchdog:** The module incorporates an efficient watchdog design that should automatically restart it in case of an internal exception. If the issue persists, investigate power supply stability or external factors.
- **Firmware:** If applicable and user-upgradable, ensure the module's firmware is up to date. Consult EBYTE's official resources for firmware updates and tools.

8. Warranty and Support

This EBYTE product is manufactured to high-quality standards and undergoes rigorous testing. For specific warranty terms and conditions, please refer to the documentation provided at the time of purchase or contact your authorized vendor.

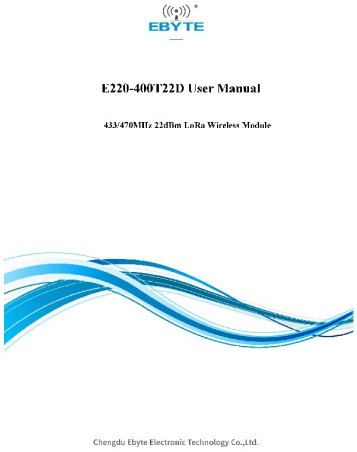
For technical assistance, detailed datasheets, application notes, or any other support inquiries, please visit the official EBYTE website or contact their customer service department. EBYTE provides customized development services for specific project requirements.

Manufacturer: Chengdu Ebyte Electronic Technology Co., Ltd.

Official Website: www.cdebyte.com

Image: Product packaging label displaying manufacturer details, including company name and address, for support and compliance purposes.

Documents - EBYTE – E220-400T22D



[pdf] User Manual Specifications Datasheet

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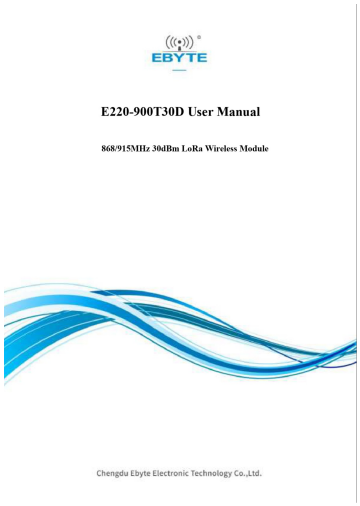

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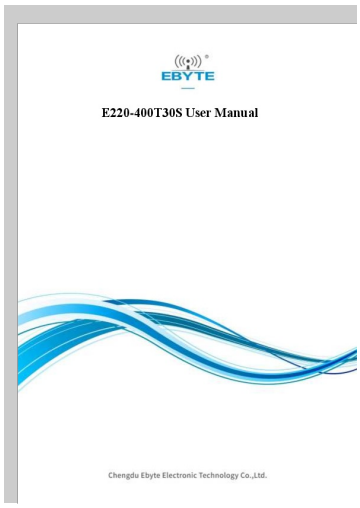

[pdf] User Manual Specifications

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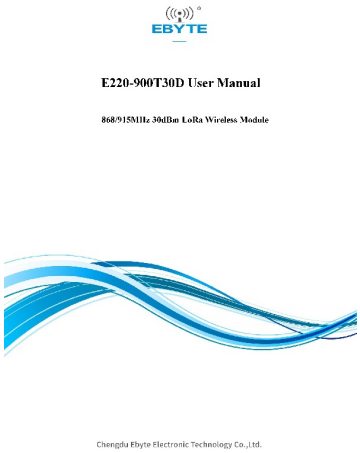

[pdf] User Manual Specifications Datasheet Diagram

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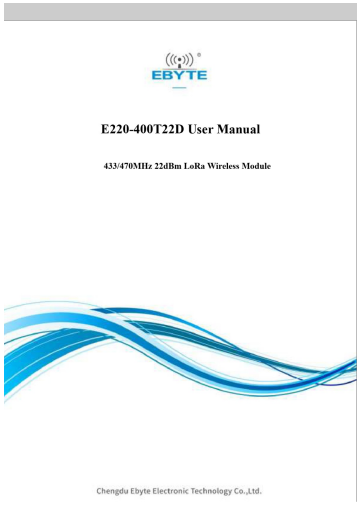

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