EBYTE E28-2G4T12S

EBYTE E28-2G4T12S Wireless Transceiver Module User Manual

Model: E28-2G4T12S

1. Introduction

The EBYTE E28-2G4T12S is a high-performance 2.4GHz wireless transceiver module designed for various applications requiring reliable long-range communication. Based on the SX1281 chip, it supports LoRa, FLRC, and GFSK modulation modes, offering robust data transmission capabilities. This manual provides essential information for the proper setup, operation, and maintenance of the module.

2. Product Overview

The E28-2G4T12S is an UART module that operates in the 2.4GHz band. It features SMD packing with both IPX and PCB antenna interfaces, and its TTL output is 3.3V. The module's design emphasizes long-range communication and strong anti-interference ability through advanced modulation techniques.

Figure 2.1: Top view of the EBYTE E28-2G4T12S module, showing the EBYTE logo, model number, and QR code.

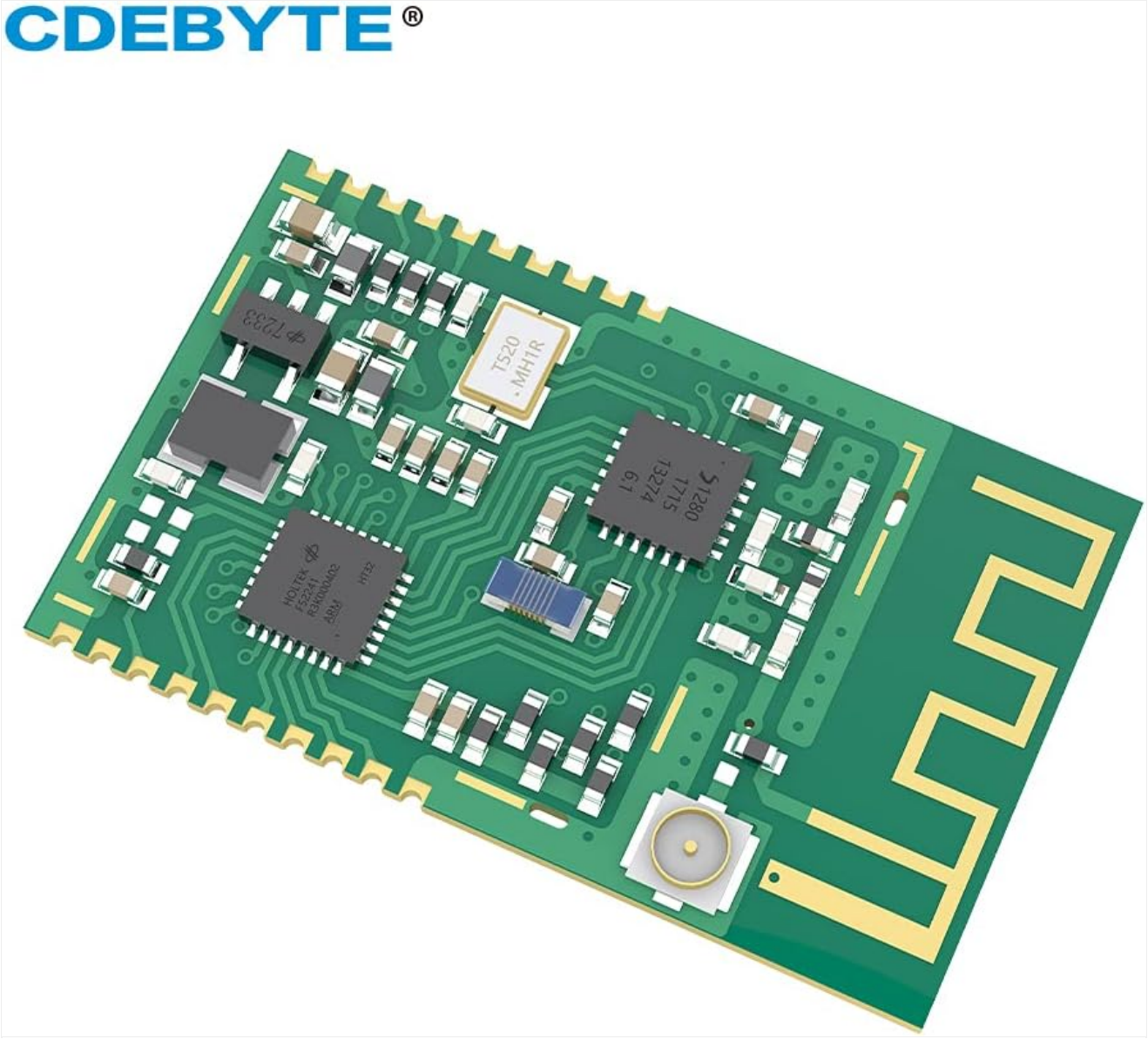


Figure 2.2: Bottom view of the EBYTE E28-2G4T12S module, revealing the internal circuitry and components.

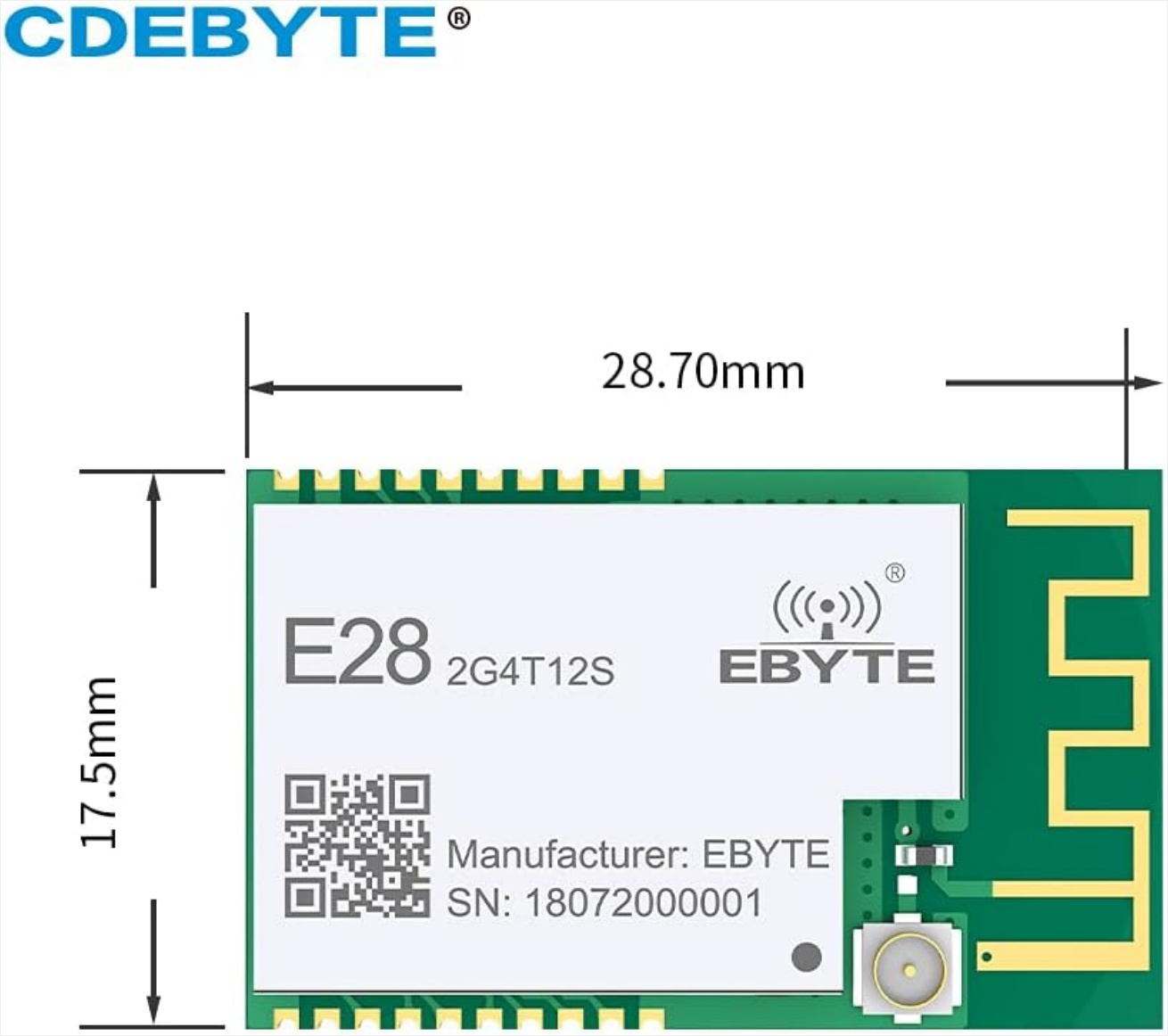


Figure 2.3: Physical dimensions of the EBYTE E28-2G4T12S module, measuring 17.5mm by 28.7mm.

3. Features

The E28-2G4T12S module incorporates several key features to ensure reliable and efficient wireless communication:

- Supports various modulation types: GFSK Mode, FLRC Mode, and LoRa Mode.
- High-speed continuous transmission with data without subcontracting.
- Integrated RSSI (Received Signal Strength Indicator) for evaluating signal quality.
- Supports fixed transmission, broadcast, and monitoring modes.
- Communication distance up to 3km in ideal conditions.
- Maximum transmitting power of 12.5dBm (software adjustable).
- Operates in the global license-free ISM 2.4GHz band.
- Supports air data rates from 1kbps to 2Mbps.
- Low power consumption, suitable for battery-supplied applications.
- Wide power supply range: 2.3V to 5.5V.
- Industrial-grade standard design, supporting a wide operating temperature range of -40°C to 85°C.
- Offers both PCB and IPEX antenna options for flexible integration.
- LoRa direct sequence spread spectrum (DSSS) for extended range and anti-interference.

- Forward error correction (FEC) algorithm for improved coding efficiency and error correction.
- Data encryption and compression features enhance security and transmission efficiency.

Figure 3.1: Visual representation of key features including 2.4GHz frequency, 12.5dBm power, 3000m range, and SMD/IPEX form factor.

4. Specifications

The following table details the main technical specifications of the EBYTE E28-2G4T12S module:

CDEBYTE®

Main Parameters	E28-2G4T12S
Product Size	17.5 * 28.7 mm
Working frequency	2400~2500 MHz
Transmitting power	12.5 dBm
Test distance	3000m
Antenna type	IPEX / PCB
Communication Interface	UART
Power supply	2.3~5.5V
Transmitting current	46mA
Receiving current	20mA
Sleep current	8μA

Figure 4.1: Main Parameters table for the E28-2G4T12S module.

Parameter	Value
IC	SX1281
Product Size	17.5 * 28.7 mm
Working Frequency	2400~2500 MHz (2.4~2.5GHz)
Transmitting Power	12.5 dBm
Test Distance (Ideal)	3000m (3km)
Antenna Type	IPEX / PCB
Communication Interface	UART
Power Supply	2.3V~5.5V
Transmitting Current	46mA
Receiving Current	20mA
Sleep Current	8μA

Parameter	Value
Operating Temperature	-40°C ~ 85°C
Item Weight	0.704 ounces
Package Dimensions	4.06 x 2.64 x 1.02 inches
Date First Available	March 22, 2021

5. Setup

Proper setup is crucial for the optimal performance of the E28-2G4T12S module. While specific wiring diagrams may vary based on your application, the general steps involve:

1. **Power Supply:** Connect the module to a stable power supply within the 2.3V to 5.5V range. Ensure the power source can provide sufficient current (e.g., 46mA during transmission).
2. **UART Connection:** Interface the module with your microcontroller or host system via its UART pins. Ensure correct connection of TX, RX, GND, and VCC. The module's TTL output is 3.3V.
3. **Antenna Connection:** Attach a suitable 2.4GHz antenna to either the IPEX connector or utilize the PCB antenna interface. Ensure the antenna is securely connected and positioned for optimal signal propagation.
4. **Configuration:** Configure the module's parameters (e.g., baud rate, modulation mode, power settings) using appropriate software commands via the UART interface. Refer to the detailed programming guide from the manufacturer for specific commands.

6. Operating Principles

The E28-2G4T12S module operates on the following principles:

- **UART Communication:** Data is sent to and received from the module using a standard Universal Asynchronous Receiver-Transmitter (UART) serial interface. This allows for easy integration with microcontrollers and other digital systems.
- **Modulation Modes:** The module supports LoRa, FLRC, and GFSK modulation. LoRa (Long Range) is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology, offering long-range communication with high interference immunity. FLRC (Fast Long Range Communication) and GFSK (Gaussian Frequency Shift Keying) provide alternative modes for different performance requirements.
- **Data Transmission:** The module handles data packets, supporting various transmission modes including fixed-point transmission, broadcast, and monitoring. The forward error correction (FEC) algorithm proactively corrects interfered data packets, significantly improving communication reliability.
- **Frequency Band:** It operates in the 2.4GHz ISM (Industrial, Scientific, and Medical) band, which is license-free globally.
- **RSSI:** The Received Signal Strength Indicator feature allows users to monitor the strength of incoming signals, which can be useful for optimizing antenna placement and network performance.

7. Applications

The versatility and robust performance of the E28-2G4T12S module make it suitable for a wide range of applications, particularly in IoT and industrial control:

- Smart Home and Industrial Sensors

- Security Systems
- Location Systems
- Wireless Remote Control
- Unmanned Aerial Vehicles (UAVs)
- Wireless Game Remote Controllers
- Health Care Products
- Wireless Voice and Headset Applications
- Automotive Industry Applications
- Intelligent Irrigation Systems

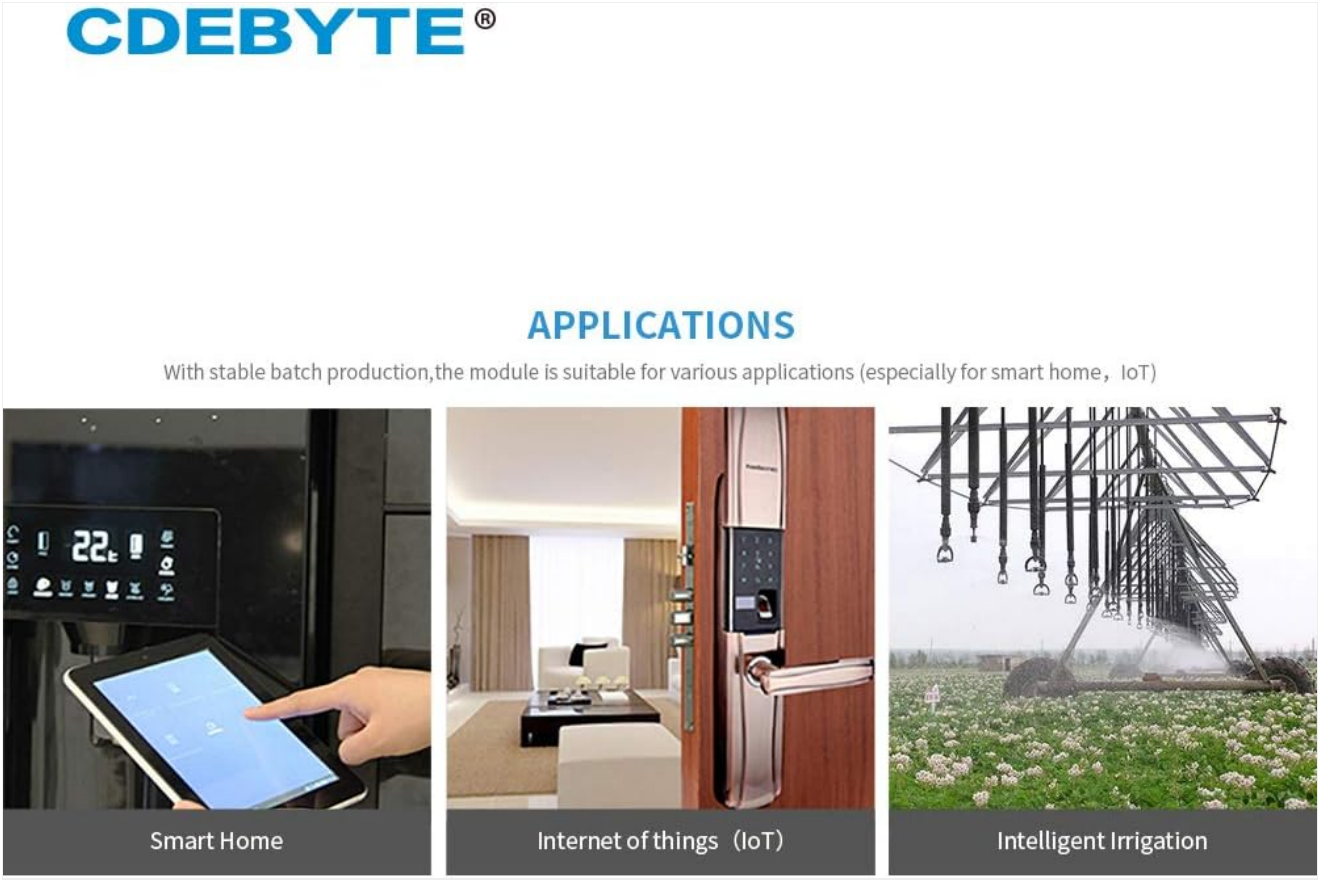


Figure 7.1: Illustrative examples of the module's applications in Smart Home, Internet of Things (IoT), and Intelligent Irrigation.

8. Maintenance

The E28-2G4T12S module is designed for industrial-grade reliability, but proper handling and environmental conditions are essential for its longevity:

- **Environmental Conditions:** Operate the module within its specified temperature range of -40°C to 85°C. Avoid exposure to extreme humidity, dust, or corrosive environments.
- **Physical Handling:** Handle the module with care to prevent physical damage to its components or solder joints. Avoid excessive force when connecting antennas or cables.
- **Power Supply:** Ensure a stable and clean power supply. Voltage fluctuations or overvoltage can damage the module.
- **Cleaning:** If necessary, clean the module gently with a dry, soft cloth. Do not use liquid cleaners or solvents.

9. Troubleshooting

If you encounter issues with your E28-2G4T12S module, consider the following troubleshooting steps:

- **No Communication:**
  - Verify power supply connections and ensure the voltage is within 2.3V-5.5V.
  - Check UART connections (TX, RX, GND) for correct wiring and ensure the host system's UART settings (baud rate, parity, stop bits) match the module's configuration.
  - Confirm the module is properly powered on and not in a low-power or sleep mode.
- **Short Communication Range:**
  - Ensure the antenna is correctly attached and is suitable for the 2.4GHz band.
  - Check for obstructions or interference sources in the communication path.
  - Verify the transmitting power setting of the module.
  - Consider the environment; ideal conditions for 3km range are open line-of-sight.
- **Unstable Connection:**
  - Check for electromagnetic interference from nearby electronic devices.
  - Ensure proper grounding of the module and host system.
  - Verify the module's configuration parameters, especially modulation mode and data rate, are appropriate for the application.

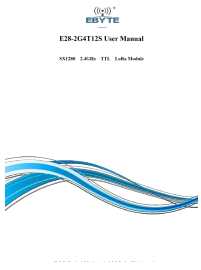
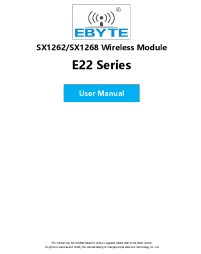
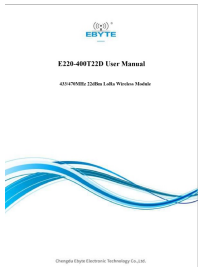
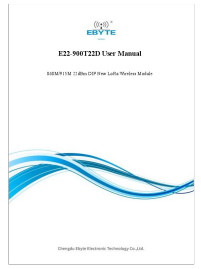
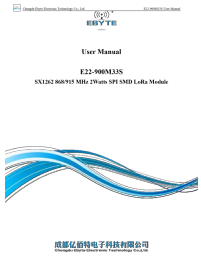
For more detailed troubleshooting or technical support, please refer to the official documentation available on the manufacturer's website.

10. Warranty and Support

EBYTE products are manufactured with high-quality standards. For specific warranty terms and conditions, please refer to the purchase agreement or contact your vendor. In case of technical issues or inquiries, please reach out to the manufacturer directly.
Manufacturer: Chengdu Ebyte Electronic Technology Co., Ltd.
Official Website: http://www.cdebyte.com/

Figure 10.1: Product packaging showing manufacturer information and compliance marks.

Related Documents - E28-2G4T12S

	[E28-2G4T12S LoRa Module User Manual - EBYTE] This user manual provides detailed information on the EBYTE E28-2G4T12S 2.4GHz TTL LoRa module, covering its features, technical specifications, operation modes, command formats, hardware design considerations, and production guidance.
	[E90-DTU(400SL47) User Manual - EBYTE LoRa Wireless Data Transceiver] User manual for the E90-DTU(400SL47) by EBYTE, a high-quality industrial-grade LoRa spread spectrum wireless digital transmission radio. Features long-distance communication, RS232/RS485 interfaces, and robust anti-interference capabilities for IoT and industrial applications.
	[EBYTE E22 Series SX1262/SX1268 Wireless Module User Manual] User manual for the EBYTE E22 Series wireless modules, including SX1262 and SX1268. Provides technical parameters, mechanical characteristics, recommended circuit diagrams, production guidance, and FAQs for these LoRa modules.
	[E220-400T22D LoRa Wireless Module User Manual - EBYTE] Detailed user manual for the EBYTE E220-400T22D 433/470MHz 22dBm LoRa Wireless Module. Covers specifications, features, operating modes, hardware design, configuration, and troubleshooting for LoRa communication.
	[E22-900T22D LoRa Wireless Module User Manual] Comprehensive user manual for the EBYTE E22-900T22D LoRa wireless module, detailing specifications, features, applications, configuration, and hardware design for 868MHz/915MHz communication.
	[E22-900M33S LoRa Module User Manual | EBYTE SX1262 868/915MHz] Explore the EBYTE E22-900M33S LoRa module user manual. This guide details the SX1262-based 868/915MHz RF transceiver, covering specifications, hardware, software, and applications for IoT and industrial systems.