

## DX-SMART LR02

# DX-Smart LR02 LoRa Module User Manual

**MODEL: LR02**

**Manufacturer: DX-SMART**

## 1. INTRODUCTION

The DX-Smart LR02 is a low-power LoRa module designed for wireless data transmission. It integrates an ASR6601 RF chip and supports UART serial communication, enabling transparent data transfer between devices. This module operates within the 433~475MHz frequency range and is suitable for various Internet of Things (IoT) applications requiring long-range and low-power connectivity.

Key features include:

- ASR6601 SOC Chip with 32-bit ARM STAR Core.
- Maximum Frequency: 48MHz.
- UART Serial Communication with configurable baud rates (1200 to 128000).
- Extensive AT command set for module configuration.
- Support for 410~493MHz frequency range, ensuring global compatibility.
- High power PA with +22dBm output.
- Maximum Receiver Sensitivity: -138dBm.
- Supports sleep mode and wake-on-air mode.
- Line-of-sight distance up to 5km in open areas.
- Operating voltage: 3.3V-5.5V (typical: 5V).
- Module Size: 36(L)x16.5(W)x4(H)mm.
- CE, FCC, RoHS certified.

## 2. SETUP AND HARDWARE CONNECTION

This section details the physical connection of the LR02 module, including pinout and wiring diagrams. Ensure correct polarity when connecting the module to an adapter board or development environment.

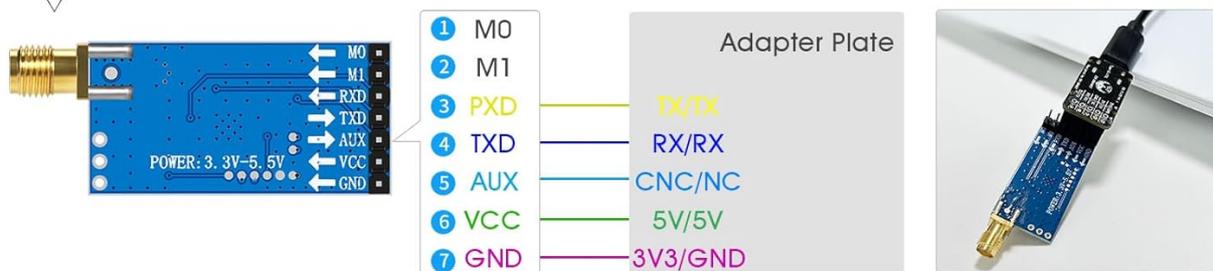
### 2.1 Module Pinout

The LR02 module features a standard pinout for easy integration. Refer to the diagram below for pin identification and function.

# LR01 & Adapter Board Wiring Diagrams

**⚠ Note:** The module and the adapter board should be inserted with positive and negative pins.

## LR01 Backplane Pinout



Example wiring diagram

- |  |                                    |
|--|------------------------------------|
| 1 MO<br>(reserved, customizable IO port) | 4 UART_TX                          |
| 2 M1<br>(reserved, customizable IO port) | 5 AUX (Refer to 2.3.4 for details) |
| 3 UART_RX                                | 6 VCC-Power Supply 3.3V-5.5V       |
|  | 7 GND                              |



### \* Indicator status

Working status: Red light blinking

Hibernation mode: light off when hibernating, red light flashing when waking up

**Figure 2.1:** LR02 Module Pinout and Example Wiring Diagram. The diagram illustrates the pin assignments for the LR02 module and a typical connection to an adapter plate, showing connections for M0, M1, PXD, TXD, RXD, AUX, VCC, and GND.

- **M0, M1:** Reserved, customizable IO ports.
- **PXD:** Not explicitly defined in the diagram, but typically related to data transmission.
- **TXD:** UART Transmit Data.
- **RXD:** UART Receive Data.
- **AUX:** Auxiliary pin (refer to detailed documentation for specific functions).
- **VCC:** Power Supply (3.3V-5.5V).
- **GND:** Ground.

## 2.2 Indicator Status

The module includes an indicator light to show its operational status:

- **Working status:** Red light blinking.

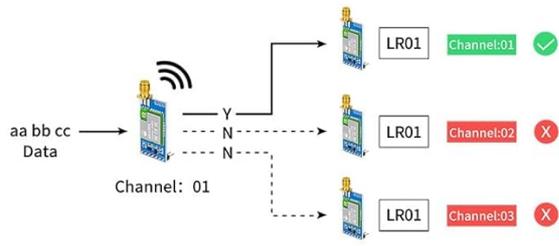
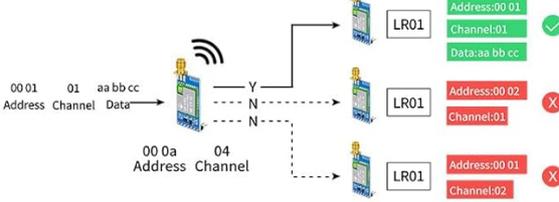
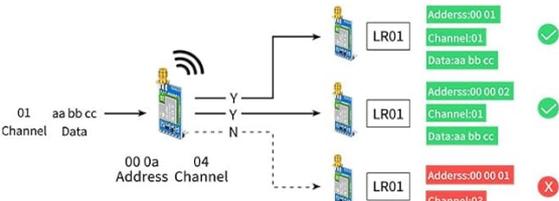
- **Hibernation mode:** Light off when hibernating, red light flashing when waking up.

### 3. OPERATING MODES AND AT COMMANDS

The LR02 module supports various working modes and is configured using a comprehensive set of AT commands via its UART serial interface. This allows for flexible integration into different applications without requiring custom LoRa programming.

#### 3.1 Supported Working Modes

The module can operate in three primary data transmission modes:

Support working mode	AT command set																				
<p><b>Module and module transparent transmission</b> This mode requires the same channel as the sender and receiver in order to send data.</p> 	<table border="1"> <thead> <tr> <th>AT command</th> <th>Command description</th> </tr> </thead> <tbody> <tr> <td>AT</td> <td>Test (Response OK)</td> </tr> <tr> <td>+++</td> <td>Enter/exit AT command mode</td> </tr> <tr> <td>AT+BAUD</td> <td>Set/query baud rate</td> </tr> <tr> <td>AT+MODE</td> <td>Set/query operating mode</td> </tr> <tr> <td>AT+SLEEP</td> <td>Set/query power consumption mode</td> </tr> <tr> <td>AT+CHANNEL</td> <td>Set/query working channels</td> </tr> <tr> <td>AT+MAC</td> <td>Set/query device address</td> </tr> <tr> <td>AT+POWE</td> <td>Set/query transmit power</td> </tr> <tr> <td>AT+IQ</td> <td>Setting the Iq signal flip-flop</td> </tr> </tbody> </table> <p> For more AT commands, please consult the product information packages. ...</p>	AT command	Command description	AT	Test (Response OK)	+++	Enter/exit AT command mode	AT+BAUD	Set/query baud rate	AT+MODE	Set/query operating mode	AT+SLEEP	Set/query power consumption mode	AT+CHANNEL	Set/query working channels	AT+MAC	Set/query device address	AT+POWE	Set/query transmit power	AT+IQ	Setting the Iq signal flip-flop
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<p><b>Modules and module broadcast transmission</b> Communicate with designated channel modules Data transmission format (hexadecimal): receiver channel+data</p> 																					

Professional technical documentation

Professional documentation can help you use the module more easily and conveniently.

  
 Product Specification

  
 Module Pinout

  
 Module Dimensions

  
 Hardware Design Reference

  
 Serial Test Tools

  
 AT Command Set

  
 Package Diagram

  
 Dedicated Aftermarket

  
 More

 If you need more details, please feel free to contact us.

**Figure 3.1:** Illustration of LR02 Module Working Modes (Transparent, Fixed-Point, Broadcast) and a partial AT Command Set. The diagram visually explains how data is transmitted in each mode and lists common AT commands for configuration.

1. **Module and Module Transparent Transmission:** Requires the same channel for both sender and receiver to transmit data.
2. **Module and Module Fixed-Point Transmission:** Communicates with modules using specified addresses and channels. Data format is hexadecimal: receiving address + receiving channel + data.

- 3. Modules and Module Broadcast Transmission:** Communicates with designated channel modules. Data format is hexadecimal: receiver channel + data.

## 3.2 AT Command Set

AT commands are used to configure and query the module's parameters. A serial port testing software can be used for this purpose.

### Regarding serial port testing software for PC

**-What is the "LoraSetting" software tool used for?**  
Support using AT commands to modify transmission mode, working channel, working power, working mode, baud rate, query device information, etc

**-AT Commands for Easy Use:**  
A rich set of AT commands can help you use the product more conveniently

**-AT command set:**

AT command	Function	Description
AT	Test Instruction	For testing serial ports
+++	Entering or exiting AT command mode	Power-up defaults to transmission mode
AT+BAUD	Setting/Querying Baud Rate	Default:4(9600)
AT+STOP	Setting/querying serial port stop bit	Default:0(0 stop bit)
AT+PARI	Set/query serial port parity bit	Default:0(no parity)
AT+MODE	Setting/querying working mode	Default:0(transparent transmission)
AT+MAC	Setting/Querying Device Address	Default:ffff

\*For more AT commands, please consult the product information packages.

**(UART Assistant Tools Screenshot)**

**Figure 3.2:** Screenshot of a UART Assistant Tools software demonstrating serial port testing and a table of common AT commands. This image shows how to interact with the module using AT commands and a software interface.

Common AT commands include:

- **AT:** Test command (responds with OK).
- **+++:** Enter/exit AT command mode.
- **AT+BAUD:** Set/query baud rate.
- **AT+MODE:** Set/query operating mode.
- **AT+SLEEP:** Set/query power consumption mode.
- **AT+CHANNEL:** Set/query working channels.
- **AT+MAC:** Set/query device address.
- **AT+POWE:** Set/query transmit power.
- **AT+IQ:** Setting the IQ signal flip-flop.

For a complete list and detailed usage of AT commands, please consult the product information packages and technical documentation provided by DX-SMART.

## 4. MAINTENANCE

The DX-Smart LR02 module is designed for robust operation. To ensure its longevity and reliable performance, consider the following general maintenance guidelines:

- **Environmental Conditions:** Operate the module within its specified temperature and humidity ranges. Avoid exposure to extreme temperatures, moisture, or corrosive environments.
- **Physical Handling:** Handle the module with care to prevent physical damage to components or solder joints. Avoid excessive force when connecting or disconnecting antennas and cables.
- **Power Supply:** Ensure a stable and clean power supply within the specified voltage range (3.3V-5.5V). Unstable power can affect performance and module lifespan.

- **Cleaning:** If necessary, gently clean the module with a soft, dry cloth. Avoid using liquids or harsh chemicals.
- **Firmware Updates:** Periodically check the manufacturer's website for any available firmware updates that may improve performance or add new features. Follow the provided instructions carefully for any update procedures.

## 5. TROUBLESHOOTING

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If you encounter issues with your DX-Smart LR02 module, consider the following troubleshooting steps:

- **No Power/Indicator Off:**
  - Verify the power supply voltage is within 3.3V-5.5V.
  - Check all power connections for proper contact and polarity.
  - Ensure the module is not in hibernation mode (indicator light off).
- **Communication Failure (UART):**
  - Confirm TXD and RXD lines are correctly connected (TX of one device to RX of the other).
  - Verify that the baud rate settings on both the module (via AT commands) and the host device match.
  - Check for any loose connections or damaged wires.
  - Ensure the module is not in sleep mode, which would prevent communication.
- **Poor Wireless Range/Connectivity:**
  - Ensure the antenna is securely connected and appropriate for the operating frequency.
  - Check for obstructions between modules (e.g., thick walls, metal objects).
  - Verify that both modules are configured to the same frequency and channel.
  - Confirm transmit power settings using AT commands.
- **Module Not Responding to AT Commands:**
  - Ensure you are sending the correct AT command prefix (e.g., '+++ ' to enter command mode).
  - Check serial port settings (baud rate, data bits, parity, stop bits).
  - Confirm the module is powered on and not in a deep sleep state.

If problems persist after following these steps, please refer to the technical support section for further assistance.

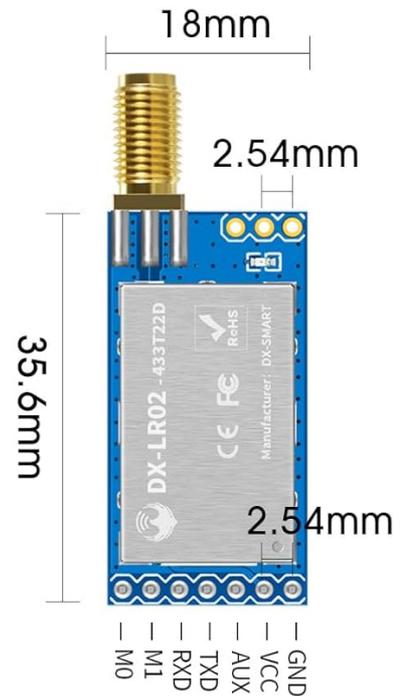
## 6. SPECIFICATIONS

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Detailed technical specifications for the DX-Smart LR02 LoRa Module:

# LR02-433T22D Key Features

- ASR6601 SOC Chip
- 32-bit ARM STAR Core,  
Maximum Frequency 48MHz
- Uart Serial Communication  
Abundant AT commands
- Support 410~493MHz,  
Global Compatibility
- High power PA,  
Output power: +22dBm
- Maximum Receiver Sensitivity: -138dBm
- Supports sleep mode, Wake on Air mode
- Line-of-sight distance up to 5km
- Operating voltage: 3.3V-5.5V (typical: 5V)
- Module Size 36(L)x16.5(W)x4(H)mm
- CE, FCC, ROHS certification



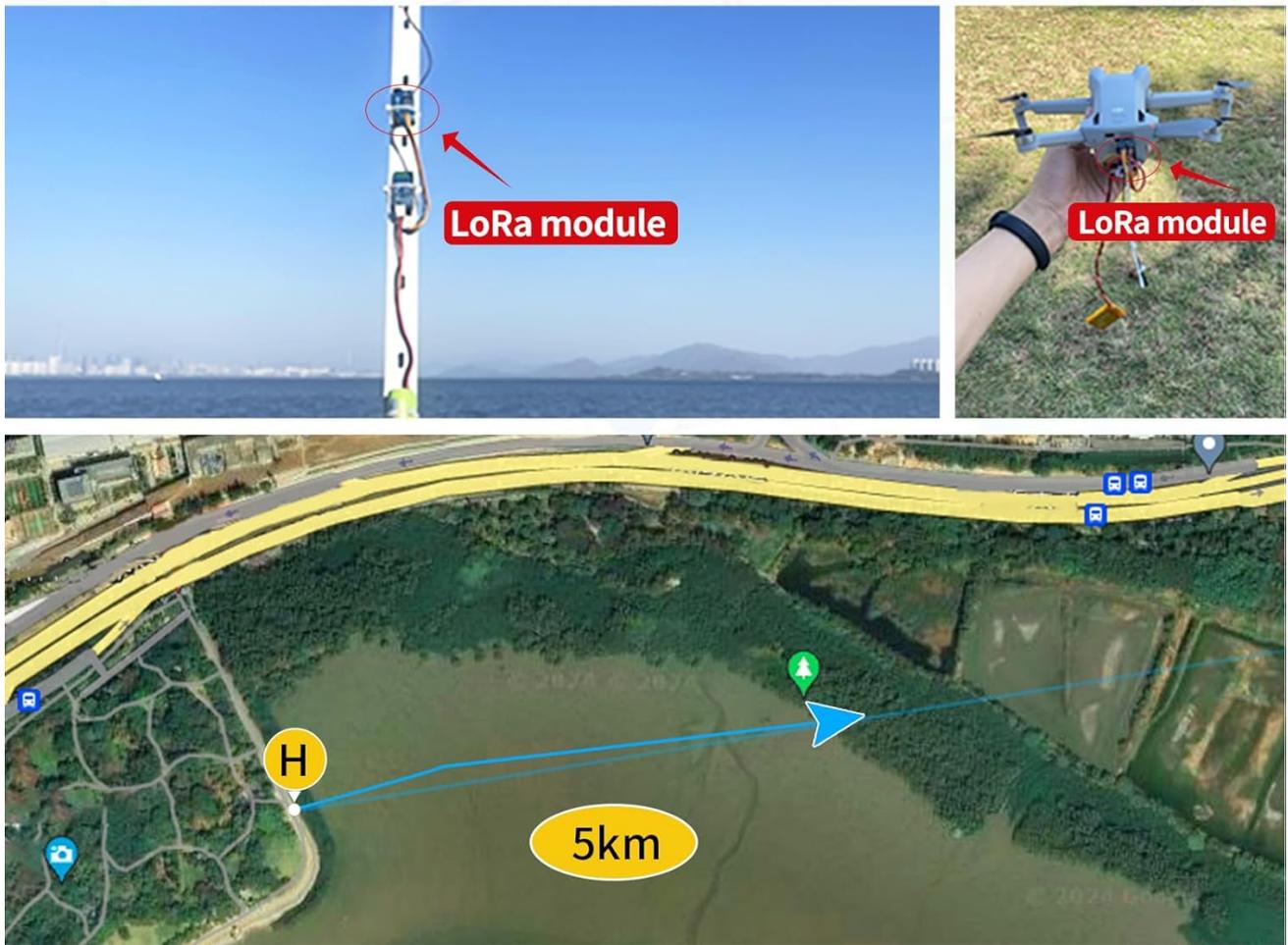
**Figure 6.1:** Visual representation of the LR02 module highlighting key features and physical dimensions (35.6mm length, 18mm width, 2.54mm pin pitch).

Parameter	Detail
Chip Model	ASR6601
Communication Interface	UART Serial Port
Wireless Type	Radio Frequency (LoRa)
Frequency Band	433~475MHz (Supports 410~493MHz)
Transmit Power	+22dBm
Receiver Sensitivity	-138dBm
Communication Distance	Up to 5km (line-of-sight in open areas)
Baud Rate Support	1200, 2400, 9600, 19200, 38400, 57600, 115200, 128000

Parameter	Detail
Operating Voltage	3.3V-5.5V (Typical: 5V)
Operating Temperature	-40°C to +85°C
Module Dimensions (L x W x H)	36mm x 16.5mm x 4mm
Certifications	CE, FCC, RoHS

## Drone measured communication distance

- ▶ ASR6601 Chip
- ▶ Visible distance up to 5km in the open



**Figure 6.2:** Image illustrating a drone-measured communication distance test, showing the LR02 module achieving a visible range of up to 5km in an open environment. Note: Actual performance may vary based on environmental factors.

## 7. WARRANTY INFORMATION

Specific warranty terms for the DX-Smart LR02 LoRa Module are typically provided at the point of purchase or within the product packaging. For detailed warranty information, including coverage period and conditions, please refer to the documentation supplied by your seller or contact DX-SMART directly.

## 8. TECHNICAL SUPPORT AND RESOURCES

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DX-SMART provides comprehensive technical support and resources to assist with the integration and operation of the LR02 module. These resources include:

- **Technical Documentation:** Detailed datasheets, user guides, and application notes.
- **AT Command Sets:** Full documentation of all available AT commands for advanced configuration.
- **Module Footprints and Reference Design Schematics:** For hardware integration.
- **Development/Test Tools:** Software and hardware tools to aid in development and testing.

For further assistance or to access these resources, please contact DX-SMART customer service. You can typically find contact information through the 'User Guide', 'Product Information', or 'Service Support' sections on the manufacturer's official website or through your product vendor.