waveshare RS3059 / RB-Wav-431

waveshare FT232RNL USB to RS232/485/422/TTL Interface Converter User Manual

Brand: waveshare | Model: RS3059 / RB-Wav-431

1. Overview

The waveshare FT232RNL USB to RS232/485/422/TTL Interface Converter is an industrial-grade isolated converter designed for reliable and stable communication across various serial interfaces. It leverages an original FT232RNL chip for superior performance and compatibility. This device is engineered with multiple protection features to ensure safe and durable operation in diverse environments.

Figure 1: waveshare FT232RNL USB to RS232/485/422/TTL Interface Converter

2. Features

- **Original FT232RNL Chip:** Ensures fast, stable, and reliable communication with enhanced compatibility.
- **Multi-Interface Conversion:** Supports USB to RS232, USB to RS485, USB to RS422, and USB to TTL.
- **Unibody Power Supply Isolation:** Provides stable isolated voltage without requiring external power for the isolated terminal.
- **Unibody Digital Isolation:** Allows signal isolation, offering high reliability, strong anti-interference, and low power consumption.
- **TVS (Transient Voltage Suppressor):** Effectively suppresses surge voltage and transient spike voltage, providing lightningproof and ESD protection.
- **Self-Recovery Fuse & Protection Diodes:** Ensures stable current/voltage outputs, offering over-current/over-voltage proof and improved shock resistance.
- **Automatic Transceiver Circuit:** Fully automatic, no-delay transceiver circuit for fast and stable communication without interference.
- **TTL Serial 3.3V/5V Voltage Translator:** Configurable TTL level via switch.
- **LED Indicators:** Three LEDs indicate power (PWR) and transceiver status (TXD, RXD).
- **High-Quality Connectors:** Durable USB-B and RS232 connectors for smooth plug/pull.
- **Industrial-Grade Metal Case:** Supports wall-mount and rail-mount installations, providing a solid and aesthetically pleasing design.

Figure 2: Internal Design and Protection Features

3. Package Content

The product package typically includes the following items:

- waveshare FT232RNL USB to RS232/485/422/TTL Interface Converter
- USB-A to USB-B Cable
- Screwdriver
- Mounting Brackets (pre-attached or separate)

Figure 3: Package Contents

4. Setup

To set up your waveshare FT232RNL converter, follow these general steps:

1. **Connect to Host:** Use the provided USB-A to USB-B cable to connect the converter's USB-B port to a USB port on your computer (PC, Mac, Linux, Android device).
2. **Driver Installation:** For most modern operating systems (Windows, Linux, Mac, Android), the necessary drivers for the FT232RNL chip should install automatically upon connection. If not, drivers can be obtained from the FTDI website or waveshare's official support page.
3. **Select TTL Level (if applicable):** If using the TTL interface, adjust the 3.3V/5V voltage translator switch on the converter to match the voltage level of your target device.
4. **Connect Serial Device:** Connect your RS232, RS485, RS422, or TTL serial device to the corresponding screw terminals or DB9 connector on the converter. Ensure correct pin assignments (refer to Section 6: Interface Introduction).
5. **Verify Connection:** The PWR LED on the converter should illuminate when connected to a powered USB port. The TXD and RXD LEDs will flash during data transmission.

Video 1: Demonstrates the connection and various interface conversions of the waveshare USB to RS232/485/422/TTL converter.

5. Operating

Once the converter is set up and connected, it operates as a transparent bridge between your USB host and the connected serial device. The onboard automatic transceiver circuit manages data flow without manual intervention.

LED Indicators:

- **PWR (Red):** Indicates power. Lights up when the USB connection is established and voltage is detected.
- **TXD (Green):** Transmit Data Indicator. Lights up when the USB port sends data.
- **RXD (Green):** Receive Data Indicator. Lights up when the device ports send data back.

To communicate with your serial device, use appropriate serial communication software on your computer. Configure the software with the correct COM port (assigned by your operating system), baud rate, data bits, parity, and stop bits to match your serial device's settings.

6. Interface Introduction

The converter provides multiple interfaces for versatile connectivity:

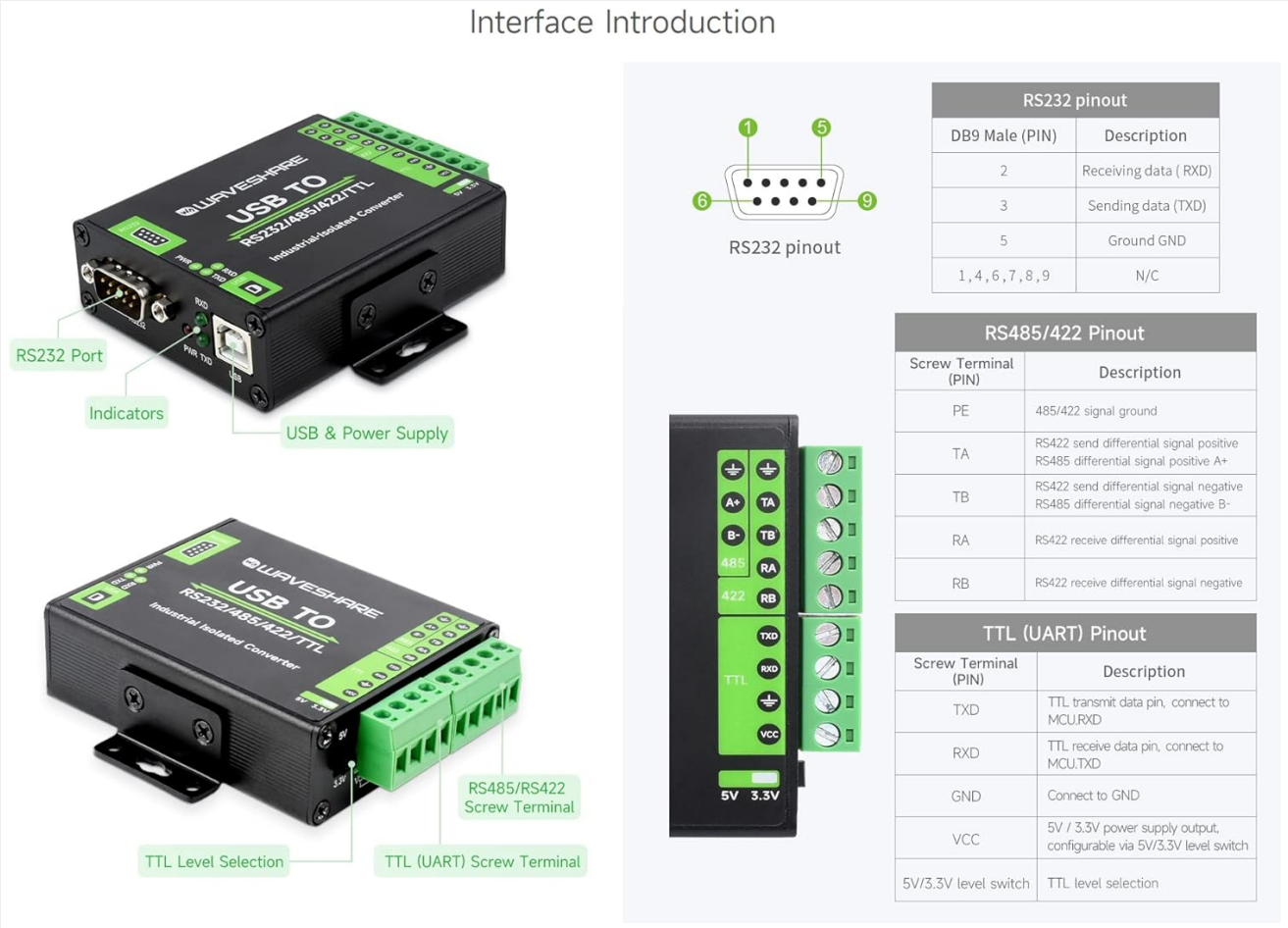


Figure 4: Overview of Converter Interfaces

RS232 Pinout (DB9 Male):

PIN	Description
2	Receiving data (RXD)
3	Sending data (TXD)
5	Ground GND
1, 4, 6, 7, 8, 9	N/C (Not Connected)

RS485/RS422 Pinout (Screw Terminal):

Screw Terminal (PIN)	Description
PE	485/422 signal ground
TA	RS422 send differential signal positive / RS485 differential signal positive A+
TB	RS422 send differential signal negative / RS485 differential signal negative B-
RA	RS422 receive differential signal positive
RB	RS422 receive differential signal negative

TTL (UART) Pinout (Screw Terminal):

Screw Terminal (PIN)	Description
TXD	TTL transmit data pin, connect to MCU.RXD
RXD	TTL receive data pin, connect to MCU.TXD
GND	Connect to GND
VCC	5V / 3.3V power supply output, configurable via 5V/3.3V level switch

RS485/422 Pinout	
Screw Terminal (PIN)	Description
PE	485/422 signal ground
TA	RS422 send differential signal positive RS485 differential signal positive A+
TB	RS422 send differential signal negative RS485 differential signal negative B-
RA	RS422 receive differential signal positive
RB	RS422 receive differential signal negative

TTL (UART) Pinout	
Screw Terminal (PIN)	Description
TXD	TTL transmit data pin, connect to MCU.RXD
RXD	TTL receive data pin, connect to MCU.TXD
GND	Connect to GND
VCC	5V / 3.3V power supply output, configurable via 5V/3.3V level switch
5V/3.3V level switch	TTL level selection

Figure 5: Detailed Pinouts

7. Specifications

Category	Specification
Product Type	Industrial grade digital isolated converter

Category	Specification
Operating Voltage	5V (USB) / 3.3V / 5V (TTL)
USB Connector	USB-B
USB Protection	200mA self-recovery fuse, isolated output
RS232 Connector	DB9 male
RS232 Protection	TVS diode, surge protection & ESD protection
RS232 Transmission Mode	Point-to-point
RS232 Baud Rate	300bps ~ 921600bps
RS485/422 Connector	Screw terminal
RS485/422 Direction Control	Hardware automatic control
RS485/422 Protection	600W lightningproof and surge-suppress, 15KV ESD protection (reserved two 120R balancing resistors, enabled/disabled via jumper)
RS485/422 Transmission Mode	Point-to-multipoints (485 mode: up to 32 nodes, repeaters recommended for 16+ nodes; 422 mode: up to 256 nodes, repeaters recommended for 16+ nodes)
RS485/422 Baud Rate	300bps ~ 2Mbps
TTL (UART) Connector	Screw terminal
TTL (UART) Pins	TXD, RXD, GND, 5V/3.3V
TTL (UART) Protection	Clamp protection diode, over-voltage/negative-voltage proof, shock resistance
TTL (UART) Transmission Mode	Point-to-point
TTL (UART) Baud Rate	300bps ~ 2Mbps
Operating Temperature	-40°C ~ 85°C
Operating Humidity	5%RH ~ 95%RH
Supported Operating Systems	Mac, Linux, Android, Windows 11 / 10 / 8.1 / 8 / 7
Package Dimensions	6.14 x 4.33 x 1.26 inches
Item Weight	1.76 ounces
Manufacturer	Waveshare

Category	Specification
Date First Available	February 6, 2023

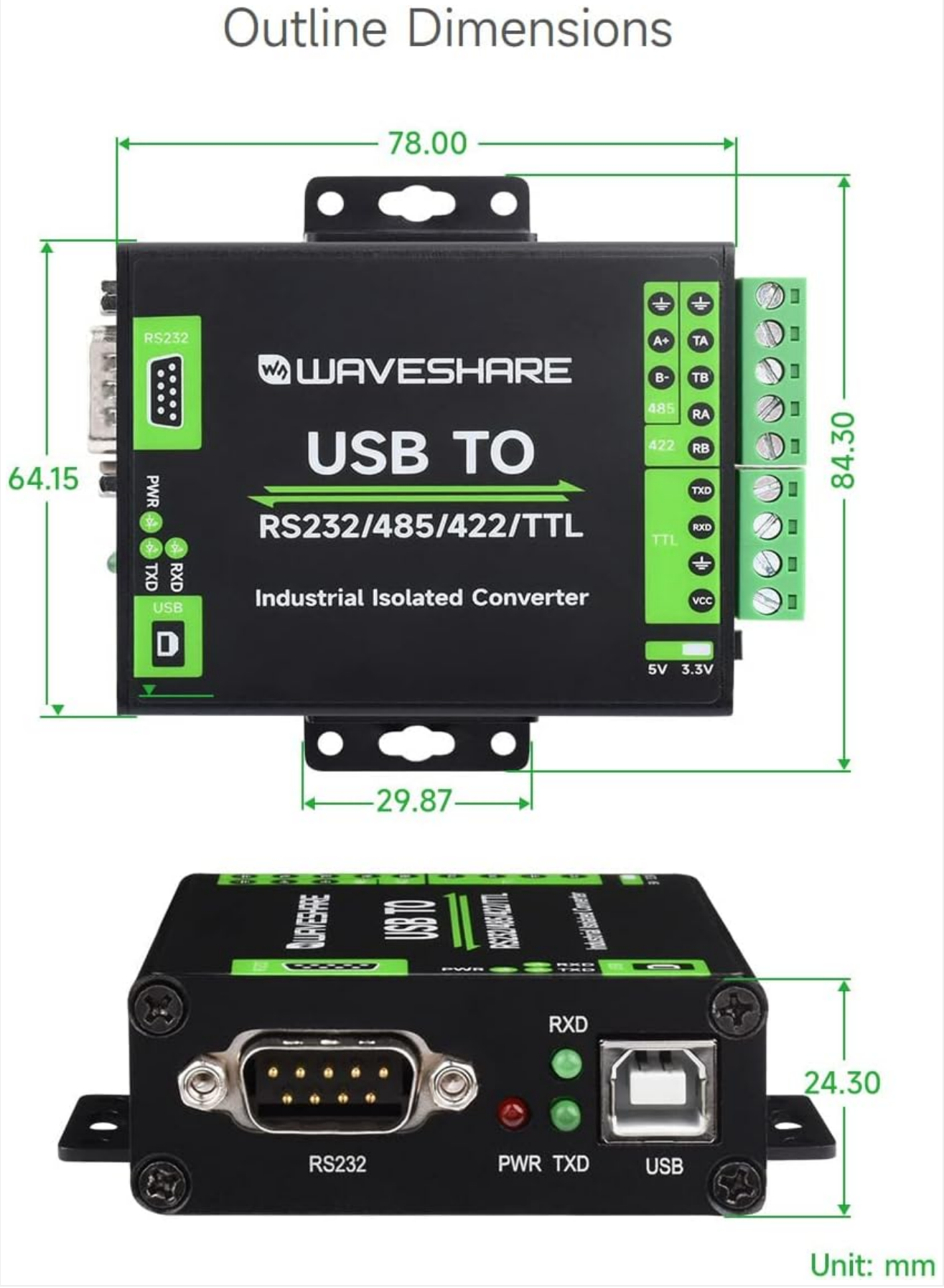


Figure 6: Outline Dimensions (Unit: mm)

8. Maintenance

To ensure the longevity and optimal performance of your waveshare FT232RNL converter, follow these maintenance guidelines:

- **Cleaning:** Use a soft, dry cloth to clean the exterior of the device. Avoid using liquid cleaners or solvents, which may damage the casing or internal components.
- **Environment:** Operate and store the converter in a clean, dry environment, away from excessive dust, moisture, and extreme temperatures. Refer to the operating temperature and humidity specifications.
- **Handling:** Handle the device with care. Avoid dropping it or subjecting it to strong impacts, which could damage the internal circuitry.
- **Connections:** Ensure all cable connections are secure and free from strain. Periodically check screw terminals for tightness.

9. Troubleshooting

If you encounter issues with your waveshare FT232RNL converter, consider the following troubleshooting steps:

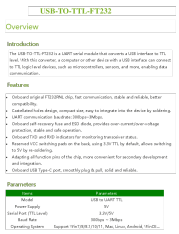
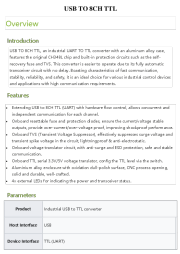
- **No Power (PWR LED Off):**
  - Ensure the USB cable is securely connected to both the converter and the host computer.
  - Try a different USB port on your computer.
  - Verify that your computer's USB port is providing power.
- **No Data Transmission (TXD/RXD LEDs not flashing):**
  - Check all serial connections (RS232, RS485, RS422, TTL) for correct wiring and secure connections.
  - Verify that the serial communication software on your computer is correctly configured (COM port, baud rate, data bits, parity, stop bits).
  - Ensure the TTL level switch is set correctly for your TTL device (3.3V or 5V).
  - Confirm that the connected serial device is powered on and functioning correctly.
- **Driver Issues:**
  - If the device is not recognized by your operating system, try reinstalling the FTDI drivers. These can typically be found on the FTDI website.
  - Check your device manager (Windows) or equivalent system information (Linux/Mac) to see if the device is listed without errors.
- **Interference:**
  - While the device has strong anti-interference capabilities, ensure it is not placed near strong electromagnetic interference sources.

10. Warranty and Support

For warranty information, technical support, or further assistance with your waveshare FT232RNL USB to RS232/485/422/TTL Interface Converter, please contact waveshare directly through their official website or the retailer from whom you purchased the product.
An official user guide in PDF format is also available for download:User Guide (PDF)

Related Documents - RS3059 / RB-Wav-431

	Waveshare USB TO RS232/485/422/TTL Industrial Grade Isolated Converter Detailed information on the Waveshare USB TO RS232/485/422/TTL industrial-grade isolated converter, featuring FT232RNL chip, multiple interface support (RS232, RS485, RS422, TTL), isolation features, and installation/testing guides.

	[USB-TO-TTL-FT232 UART Serial Module - Waveshare] Comprehensive guide for the Waveshare USB-TO-TTL-FT232 module, featuring the FT232RNL chip. This document details its features, onboard interface, pinout, dimensions, and provides step-by-step instructions for driver installation and usage on Windows, Linux, and macOS. Includes links to drivers and software.
	[Waveshare USB to RS232/485/TTL User Manual] This user manual provides detailed information on the Waveshare USB to RS232/485/TTL Industrial Isolated Converter. It covers product overview, features, specifications, driver installation, and testing procedures for RS232, RS485, and TTL (UART) interfaces. The converter utilizes an FT232RL chip and offers robust protection circuits.
	[Waveshare WS-TTL-CAN User Manual: TTL to CAN Converter Guide] Explore the Waveshare WS-TTL-CAN module with this comprehensive user manual. Learn about its TTL and CAN communication capabilities, hardware features, parameter configuration using WS-CAN-TOOL, and various conversion examples.
	[USB TO 8CH TTL Industrial UART to TTL Converter - Product Overview and Guide] Detailed information on the USB TO 8CH TTL industrial UART to TTL converter, including features, specifications, driver installation, and communication operation. Features CH348L chip, robust protection circuits, and 8-channel TTL output.
	[Waveshare USB TO RS232/485/TTL Isolated Converter User Manual] User manual for the Waveshare USB TO RS232/485/TTL industrial isolated converter. Covers features, specifications, driver installation, and testing for RS232, RS485, and TTL interfaces. Includes FT232RL chipset, ADI magnetical isolation, and TVS protection.