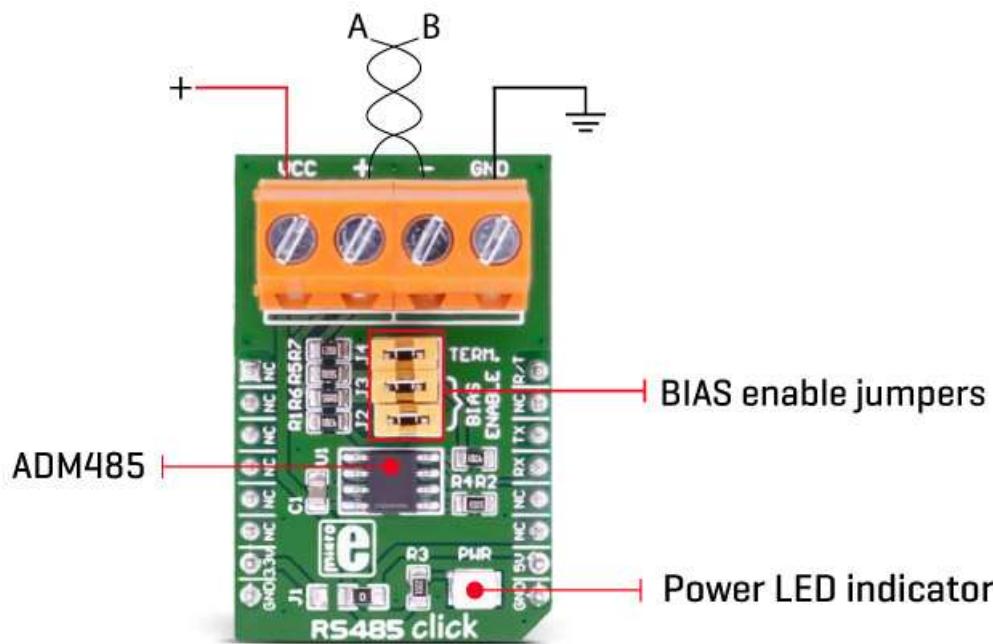


**RS485 click 5V** is an RS422/485 transceiver Click board™, which can be used as an interface between the TTL level UART and the RS422/485 communication bus. It features a half-duplex communication capability, bus Idle, open, and short-circuit detection, thermal shutdown, and more. It is well suited for transmitting data packets over long distances and noisy areas, using the twisted wire bus, which offers good electromagnetic interferences (EMI) immunity.

Due to its robustness and reliability, the RS485 click 5V can be used in various applications that require reliable data transfer in various noisy environments, or over a substantial distance, when data rate transfer up to 1 Mbps is sufficient. RS485 5V click can be used for controlling various building automation systems, intelligent lighting systems (DMX), Point-of-Sale (POS) networks, and various other devices that need to establish a reliable communication over the RS422/485 bus.

## HOW DOES IT WORK?

RS485 click 5V uses the [ADM485](#), an RS-422/485, half-duplex, tristate differential line driver and differential input line receiver, from [Analog Devices](#). This click is intended to be used as a physical layer device, often referred to as PHY, providing physical interfacing of the MCU TTL level UART lines with the RS422/485 bus. It is well suited for transmitting smaller blocks of data over long distances, using a twisted differential signal pair, for both TX and RX signals, allowing for half-duplex asynchronous communication. The ADM485 transceiver consists of a separate driver and receiver sections, with Driver Enable and Receiver Enable pins (#RE and DE), used to enable the appropriate sections. Driver section is used to drive the RS422/485 bus with the signal received on the UART RX line labeled as DI on the IC, while the receiver section returns data from the bus back to the MCU via the UART TX line, labeled as RO on the IC in the schematics.



RS422/485 standard only specifies the electrical characteristics of the transmitter and the receiver. It does not specify or recommend any communications protocol, only the physical layer. The top layer communication protocol of choice can be used, such as the MODBUS or similar protocols. Therefore RS485 click 5V offers UART RX and TX pins, routed to the appropriate mikroBUS™ TX and RX UART pins. These pins are used by the MCU to send data to the RS485 bus, in a form

determined by the user protocol. Additional DE and #RE pins are joined together and routed to the mikroBUS™ PWM pin. This pin is labeled as R/T on the Click board™. A pull-down resistor is used to determine states on these pins when they are left floating. Note that DE and RE pins use the opposite signal polarities for the active state, making it possible to drive them with a single MCU pin. When a HIGH logic level is applied to the R/T pin, transmitter becomes activated, while the receiver is deactivated at the same time - and vice versa. The R/T pin acts as a communication direction pin, in this configuration.

The ADM485 IC allows communication with data rates up to 5 Mbps. However, the maximal transfer speed is determined by the bus length: longer bus lines will result in less transfer speed. The RS422/RS485 bus needs to be terminated with the resistor on both ends (so-called parallel termination), which is equal to the characteristic impedance of the used cable, in order to prevent line reflections. The RS485 standard prescribes using a twisted pair cable as the data bus. Twisted pair cable tends to cancel common-mode noise and causes cancellation of the magnetic fields generated by the current flowing through each wire, thereby reducing the effective inductance of the pair.

The Click board™ is equipped with a jumper, that can be used to route the termination resistor of  $120\ \Omega$  between the bus lines. The Click board™ is equipped with two more jumpers, labeled as BIAS ENABLE. These jumpers are used to enable biasing of the bus by using pull-up and pull-down resistors between the bus differential lines and VCC/GND, respectively, preventing certain faulty conditions when no drivers are enabled on the bus, in addition to existing IC protection.

The RS-485 standard specifies that a compliant driver must be able to drive 32 unit loads (UL), where 1 unit load represents a load impedance of approximately  $12\ k\Omega$ . This means that one driver can drive up to 32 ADM485 receivers.

The ADM485 receiver input hysteresis of about 70 mV to enhance the noise immunity. The ADM485 IC also features a true fail-safe receiver input, which guarantees a logic HIGH receiver output in cases when the receiver inputs are left unconnected or open.

There are two 2-pole screw terminals on board (VCC, +, -, GND) for connecting RS422/485 bus twisted pair cable, along with the GND and VCC. The terminal inputs labeled as "+" and "-" are used to connect the bus wires. GND and VCC rails can be used to provide the power supply for another node. Note that the VCC terminal is directly routed to the 5V rail of the mikroBUS™.

MikroElektronika provides a library that contains functions compatible with the MikroElektronika compilers, which can be used for working with the RS485 click 5V. The library also contains an example application, which demonstrates its use. This example application can be used as a reference for custom designs.

## SPECIFICATIONS

Type	RS485
Applications	Board is suitable for Low power RS-485 systems, DTE/DCE interface Packet switching, Local area networks (LNAs), Data concentration, Data multiplexers, Integrated services digital network (ISDN) and more.
On-board modules	ADM485 differential line transceiver

<b>Key Features</b>	Meets EIA RS-485 standard; 5 Mbps data rate; Short-circuit protection
<b>Interface</b>	GPIO, UART
<b>Compatibility</b>	mikroBUS
<b>Click board size</b>	M (42.9 x 25.4 mm)
<b>Input Voltage</b>	5V

## PINOUT DIAGRAM

This table shows how the pinout on **RS485 click 5V** corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS				Pin	Notes
	NC	1	AN	PWM	16	R/W	Receive/Transmit
	NC	2	RST	INT	15	NC	
	NC	3	CS	RX	14	TX	UART transmit data
	NC	4	SCK	TX	13	RX	UART receive data
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
	NC	7	3.3V	5V	10	5V	Power supply
Ground	GND	8	GND	GND	9	GND	Ground

## RS485 CLICK 5V ELECTRICAL SPECIFICATIONS

Description	Min	Typ	Max	Unit
Bus common mode range	-7	-	12	V
Output Short-Circuit Current	-250	-	250	mA

## ONBOARD SETTINGS AND INDICATORS

Label	Name	Default	Description
LD1	PWR	-	Power LED indicator
JP2	BIAS ENABLE	-	Pull-up resistor enables the positive bus line (non-

			inverted line)
JP3	BIAS ENABLE	-	Pull-down resistor enables the negative bus line (inverted line)
JP4	TERM	-	Termination resistor enable

## SOFTWARE SUPPORT

We provide a demo application for the RS485 click 5V click on our [LibStock](#) page, as well as a demo application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

### Library Description

Library initializes and defines a GPIO driver and performs control of device voltage. For more details check the documentation.

Key functions:

- `void rs485_writeByte(uint8_t input)` - Write Single Byte.
- `uint8_t rs485_readByte()` - Read Single Byte.
- `uint8_t rs485_byteReady()` - Check for new byte received.

### Example description

The application is composed of three sections:

- System Initialization - Initializes UART module.
- Application Initialization - Driver initialization.
- Application Task - (code snippet) - Checks if new data byte has been received in the RX buffer (ready for reading), and if it has then it reads one byte from the RX buffer. Otherwise, the application task writes the message data via UART.

```
void applicationTask()
{
    char tmp;
    uint8_t rdyFlag;

    // RECEIVER - UART polling

    rdyFlag = rs485_byteReady();

    if (1 == rdyFlag)
    {
        tmp = rs485_readByte();
        mikrobus_logWrite( &tmp, _LOG_BYTE );
    }

    // TRANSMITTER - TX each 2 sec

    for (tmp = 0; tmp < 9; tmp++)
    {
```

```
rs485_writeByte( MESSAGE_DATA[tmp] );
mikrobus_logWrite( "MESSAGE SENT", _LOG_LINE );
}
Delay_ms(2000);
}
```

The full application code and ready to use projects can be found on our [LibStock](#) page.

Other mikroE Libraries used in this example:

- UART

### Additional notes and information

Depending on the development board you are using, you may need [USB UART click](#), [USB UART 2 click](#) or [RS232 click](#) to connect to your PC, for development systems with no UART to USB interface available on the board. The terminal available in all MikroElektronika [compilers](#), or any other terminal application of your choice, can be used to read the message.

## RESOURCES

[Click board™ Catalog](#)  
[Click Boards™](#)  
[mikroBUS™](#)  
[mikroSDK](#)  
[ADM485 datasheet](#)

## DOWNLOADS

[RS485 click example on Libstock](#)  
[RS485 click 5V schematic](#)  
[RS485 click 5V: 2D and 3D files](#)  
[ADM485 datasheet](#)