

MCP2003B Click



PID: MIKROE-2227

MCP2003B Click is a compact add-on board with a physical interface to automotive and industrial LIN systems compliant with the LIN Bus Specification Revision 2.2, SAE J2602, and ISO 17987. This board features the MCP2003B, a LIN transceiver from Microchip. The LIN, which stands for a Local Interconnect Network, is used in conjunction with the CAN interface for communication between the components inside of vehicles. The MCP2003B is a bi-directional half-duplex LIN transceiver that supports baud rates up to 20Kbaud with a LIN-compatible output driver. According to the standard on which this LIN transceiver works, connecting up to 15 peripheral devices to a single controller device is possible. This Click board™ makes the perfect solution for the development of sensor networks for vehicles.

MCP2003B Click is supported by a [mikroSDK](#) compliant library, which includes functions that simplify software development. This [Click board™](#) comes as a fully tested product, ready to be used on a system equipped with the [mikroBUS™](#) socket.

How does it work?

MCP2003B Click is based on the MCP2003B, a LIN transceiver from Microchip. This transceiver has both short-circuit and overtemperature protection by internal circuitry. It is designed to operate in an automotive environment and will work in specified transient conditions while meeting all stringent quiescent requirements. The MCP2003B has very high electromagnetic immunity (EMI), 60V load dump protection, high electrostatic discharge (ESD) immunity without TVS, and very high immunity to RF disturbances. It also can work in low-power mode and has an automatic thermal shutdown. One of the protections is direct capacitor coupling robustness without transient voltage suppressor (TVS) of $\pm 35V$ and $\pm 85V$ on LBUS, ground loss protection, reverse supply protection and many more.

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The MCP2003B Click has four operational modes: Power-Down mode, Ready mode, Operation mode, and Transmitter OFF mode. In Power-Down mode, the lowest power mode, everything except the wake-up pin (LWK on an unpopulated header) is shut down. LIN Bus activity typically changes the device from Power-down to Ready mode in 70µs. In Ready mode, the receiver is powered up and is ready to receive data while the transmitter is disabled. In Operational mode, all internal modules are operational. The Transmitter OFF mode is reached whenever the transmitter is disabled due to a fault condition, for example, if there is a thermal overload, bus contention, RSD monitoring, and TXD timer expiration. For the typical application as a Master node, the MCP2003B requires the LBUS line of the chip to be connected to the VBB of the LIN BUS, achievable via a populated L-PULL jumper. This jumper can be removed in other scenarios, such as the LIN Slave node.

To communicate with the host microcontroller, the MCP2003B uses a UART interface with commonly used UART RX and TX pins as its default communication protocol to transmit and exchange data. The RX pin is internally monitored and must be at a high level, while LBUS is recessive in Operation mode. Otherwise, an internal fault will be created, and the device will transition to Transmitter Off mode. A voltage regulator sensing circuit, comprised of an MCP1804 regulator and controlled via MCP2003B itself, is connected to the RX pin and internally monitors the RX pin when the LBUS line is recessive (RX is in a high logic state). If the RX pin is left open, it will not allow the device to switch (or stay) in Operation Mode. That's why the RX pin is connected to a valid supply, provided by the voltage regulator, through a pull-up 2.2kΩ resistor.

A CS SEL jumper can be used to set the chip select pin of the MCP2003B permanently connected to a logic HIGH (set by default), thus enabled all the time, or that the MCU performs this function via the CS of the mikroBUS™ socket. The extra pins LWK (CS on mikroBUS™ socket), CS (Wake-up pin on MCP2003B), TX, and RX are also available above the mikroBUS™ and can be used for external control. The wake-up from power-down mode can be controlled only through the LWK pin of this header. The RXD, TXD, CS, and LWK pins tolerate high voltage.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used, as a reference, for further development.

Specifications

Type	LIN
Applications	Can be used for the development of sensor networks for vehicles
On-board modules	MCP2003B - LIN transceiver from Microchip
Key Features	Bi-directional LIN transceiver, LIN BUS interface tolerant to high voltages, supported baud rates of up to 20Kbaud, very high electromagnetic immunity (EMI), high electrostatic discharge (ESD), wide supply voltage, low power mode, automatic thermal shutdown, and more
Interface	GPIO, UART
Feature	No ClickID

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Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on MCP2003B Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Voltage Regulator Monitor	VREN	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	NC	
Chip Select	CS	3	CS	RX	14	TX	UART TX
	NC	4	SCK	TX	13	RX	UART RX
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	3.3V	7	3.3V	5V	10	NC	
Ground	GND	8	GND	GND	9	GND	Ground

Onboard settings and indicators

Label	Name	Default	Description
-	PWR	-	Power LED Indicator
J1	CS SEL	Right	Chip Select Selection CS/HI: Left position CS, Right position HI
JMPR	L-PULL	Populated	Master Node Operation Selection Jumper

MCP2003B Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
LIN Supply Voltage	5.5	-	30	V
Load Dump Protection	-	60	-	V
Operating Current	-	65	150	µA
Data Rates with LIN-compatible Driver	-	-	20	Kbaud

Software Support

We provide a library for the MCP2003B Click as well as a demo application (example), developed using MIKROE [compilers](#). The demo can run on all the main MIKROE [development boards](#).

Package can be downloaded/installed directly from NECTO Studio Package Manager (recommended), downloaded from our [LibStock™](#) or found on [MIKROE github account](#).

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Library Description

This library contains API for MCP2003B Click driver.

Key functions

- `mcp2003b_generic_write` This function writes a desired number of data bytes by using UART serial interface.
- `mcp2003b_generic_read` This function reads a desired number of data bytes by using UART serial interface.
- `mcp2003b_set_cs_pin` This function sets the chip select (CS) pin logic state.

Example Description

This example demonstrates the use of an MCP2003B Click by showing the communication between the two Click board™ configured as a receiver and transmitter.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager (recommended), downloaded from our [LibStock™](#) or found on [MIKROE github account](#).

Other MIKROE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.MCP2003B

Additional notes and informations

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. UART terminal is available in all MIKROE [compilers](#).

mikroSDK

This Click board™ is supported with [mikroSDK](#) - MIKROE Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the [LibStock](#) and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click Boards™](#)

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Downloads

[MCP2003B click example on Libstock](#)

[MCP2003B click schematic](#)

[MCP2003B click 2D and 3D files](#)

[MCP2003B datasheet](#)

[MCP1804 datasheet](#)

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