MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

ETH WIZ 3 Click

PID: MIKROE-6646

ETH WIZ 3 Click is a compact add-on board designed to provide Ethernet connectivity combined with onboard processing capabilities for embedded and IoT applications. It is based on the W55RP20 System-in-Package (SiP) from WIZNet, which integrates the W5500 Ethernet controller with a Raspberry Pi RP2040 dual-core microcontroller. The board features a hardwired TCP/IP stack supporting multiple network protocols, an integrated Ethernet PHY, a dual Arm Cortex-M0+ processor running at up to 133MHz, on-chip Flash and SRAM memory, selectable SPI or UART communication via a COMM SEL jumper, and a USB Type-C interface driven by the internal USB 2.0 controller. Additional functionality includes TCP activity indication, status LEDs for link diagnostics, exposed Ethernet magnetics center taps for optional PoE implementation, and accessible debugging test points. This Click board is ideal for IoT gateways, industrial automation, smart devices, network-enabled controllers, and embedded systems requiring efficient and simplified Ethernet integration.

For more information about **ETH WIZ 3 Click** visit the official product page.

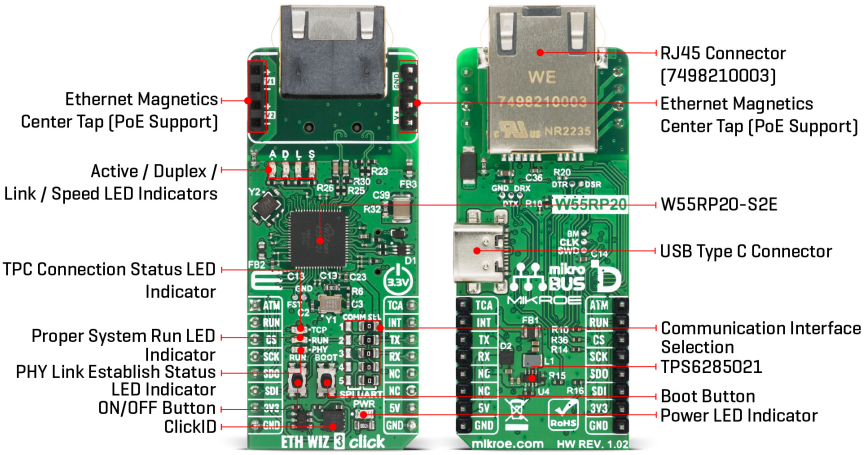
How does it work?

ETH WIZ 3 Click is based on the W55RP20, a System-in-Package (SiP) solution from WIZNet that combines the proven W5500 Ethernet controller with the RP2040 microcontroller developed by Raspberry Pi, providing both networking and application-level processing within a single device. By integrating a hardware TCP/IP stack alongside a dual-core microcontroller architecture, the W55RP20 reduces system complexity, eliminating the need for external Ethernet controllers, additional processing units, or external memory components while simplifying firmware development and network management. The embedded W5500 Ethernet controller implements a hardwired TCP/IP stack that supports TCP, UDP, IPv4, ICMP, ARP, IGMP, and PPPoE

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.
ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.
ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

protocols, allowing stable and deterministic network communication with minimal MCU overhead and ensuring predictable performance even in demanding real-time environments.



The integrated RP2040 microcontroller features a dual-core Arm Cortex-M0+ processor operating at up to 133MHz, delivering sufficient computational performance for multitasking, data acquisition, and control-oriented applications while maintaining low power consumption. With 2MB of on-chip Flash memory and 264kB of SRAM, the device provides ample storage and runtime memory for complex firmware, communication buffers, and application logic without requiring external memory expansion. The architecture further includes a DMA controller and a fully connected AHB crossbar, enabling efficient data movement between peripherals and memory resources while minimizing CPU intervention and improving overall system responsiveness. Additional hardware acceleration elements such as interpolator units and an integer divider peripheral enhance performance in mathematical and signal-processing tasks commonly found in embedded applications.

The W55RP20 also integrates an Ethernet PHY, simplifying hardware design and ensuring direct compatibility with standard 10Base-T and 100Base-TX Ethernet networks through the onboard connector, while built-in timing resources, including one watchdog timer and four general-purpose timers, support reliable system supervision and precise timing control. Designed for flexibility and ease of development, the controller supports widely adopted programming environments and languages allowing developers to rapidly prototype solutions across industrial automation, smart devices, IoT gateways, and network-enabled control systems.

The board exposes the V1+, V1−, V2+, and V2− pins, which represent the center taps of the integrated Ethernet magnetics inside the RJ45 connector. These pins are routed to an unpopulated header to provide optional access for advanced hardware configurations, primarily enabling Power-over-Ethernet (PoE) implementation. While not required for standard Ethernet operation, the center taps allow users to integrate an external PoE powered device (PD) circuit or apply custom biasing and filtering if needed. This design approach preserves full compatibility with conventional Ethernet setups while offering additional flexibility for users who wish to extend the board with PoE functionality or specialized networking applications.

ETH WIZ 3 Click provides additional hardware functionality and flexible control features through carefully selected communication interfaces and dedicated control signals available on the mikroBUS™ socket. The board supports both SPI and UART communication interfaces, which can be selected using the onboard COMM SEL jumper, allowing developers to choose the most suitable communication method depending on application requirements, host MCU capabilities,

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISOQAR REGISTERED
UKAS MANAGEMENT SYSTEMS
ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.
TÜV SÜD ISO 9001
ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

or desired data throughput. Additionally, the board features a USB Type-C connector connected to the W55RP20 integrated USB 2.0 controller, supporting full-speed (12Mbps) USB communication with hardware-level protocol handling. In addition to communication signals, the board includes a RUN control pin accompanied by a dedicated RUN button that performs device enable and MCU reset functionality, allowing users to manually restart or control the operational state of the onboard controller when required. A RUN LED indicator is also provided to visually represent the MCU status, blinking during normal operation to confirm that firmware execution is active and the system is functioning correctly.

For advanced device management, the ATM pin enables entry into AT command mode and operates as an active-low control signal, allowing the host system or user to switch the device into a serial command interface used for configuration, diagnostics, and chip control without modifying application firmware. Network activity monitoring is supported through the TCA signal, which indicates an active TCP connection and is paired with a dedicated TCP LED indicator that provides immediate visual feedback when a TCP session is established and operational. The board further includes an interrupt (INT) signal routed to the mikroBUS™ socket, enabling efficient event-driven communication by notifying the host MCU of network events or internal controller conditions without continuous polling. A BOOT button is also implemented to support flash reset and RP2040 boot functionality, operating as an active-low signal in accordance with the RP2040 boot sequence and allowing users to place the device into bootloader mode for firmware programming or recovery procedures involving the internal flash memory.

Board is also equipped with a set of LED indicators that provide clear, real-time visual feedback about Ethernet link conditions, physical layer activity, and communication status, significantly simplifying system diagnostics and development monitoring. A PHY LED indicates the overall physical layer link status, allowing users to quickly verify whether the Ethernet PHY is properly connected and operational at the hardware level. The Active (A) LED serves as a carrier sense indicator, signaling activity detected by the Physical Medium Dependent (PMD) sublayer during both transmission and reception, thereby confirming ongoing network traffic whenever data is being transmitted or received across the Ethernet interface.

Duplex operation is represented by the Duplex (D) LED indicator, which reflects the negotiated communication mode of the established link and allows users to identify whether the connection is operating in full-duplex or half-duplex mode, providing immediate insight into link configuration and potential performance characteristics. The Link (L) LED indicates whether a valid Ethernet link has been successfully established with a connected network device, offering a straightforward confirmation of cable connection and network availability. Complementing this functionality, the Speed (S) LED displays the negotiated communication speed of the active connection, clearly distinguishing between 10Mbps and 100Mbps operation, which helps users confirm correct network negotiation and troubleshoot performance-related issues.

ETH WIZ 3 Click also includes a set of dedicated test points that provide direct access to important control, debugging, and development signals. The BM test point is used for firmware boot mode control, allowing developers to manage the boot configuration of the internal Serial-to-Ethernet firmware and select the appropriate startup behavior when performing development, recovery, or firmware-related operations. Debugging capabilities are supported through the DTX and DRX test points, which expose the debug UART interface. Additional serial control signals are available through the DTR and DSR test points, providing hardware flow-control access that can be used for advanced serial communication scenarios or specialized debugging workflows requiring handshake signaling. For low-level programming and debugging of the onboard RP2040 microcontroller, dedicated SWD interface access is provided through the SWD and CLK test points, where CLK corresponds to the SWCLK signal used for serial wire

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.
ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.
ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

debugging and programming operations. The board also features an FST test point, which allows users to reset the IP configuration parameters to factory default values while preserving the existing firmware image, offering a convenient recovery mechanism in cases of misconfiguration without requiring full firmware reprogramming.

This Click board™ can be operated only with a 5V supply, but uses 3.3V or 5V logic voltage levels. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used as a reference for further development.

Specifications

Type	Ethernet
Applications	Ideal for IoT gateways, industrial automation, smart devices, network-enabled controllers, and embedded systems requiring simplified Ethernet integration
On-board modules	W55RP20 - 10BaseT/100BaseTX Ethernet MACPHY with RP2040 MCU from WizNet
Key Features	Dual-core Arm Cortex-M0+ processor operating at up to 133MHz, integrated hardwired TCP/IP stack with support for TCP, UDP, IPv4, ICMP, ARP, IGMP, and PPPoE protocols, built-in 10Base-T/100Base-TX Ethernet PHY, System-in-Package integration combining W5500 Ethernet controller and RP2040 MCU, 2MB on-chip Flash memory and 264kB SRAM, DMA controller and fully connected AHB crossbar architecture, selectable communication, USB Type-C interface, and more
Interface	SPI,UART
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V,5V,External

Pinout diagram

This table shows how the pinout on ETH WIZ 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
AT Mode Selection	**ATM**	1	AN	PWM	16	**TCA**	TCP Connection Indicator
Device Enable / ID SEL	**RUN**	2	RST	INT	15	**INT**	UART RTS / Interrupt
UART CTS / SPI Select / ID COMM	**CS**	3	CS	RX	14	**TX**	UART TX

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

SPI Clock	**SCK**	4	SCK	TX	13	**RX**	UART RX
SPI Data OUT	**SDO**	5	MISO	SCL	12	NC	
SPI Data IN	**SDI**	6	MOSI	SDA	11	NC	
Power Supply	**3.3V**	7	3.3V	5V	10	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
LD2	TCP	-	TCP Connection Status LED Indicator
LD3	PHY	-	PHY Link Establish Status LED Indicator
LD4	RUN	-	Proper System Run LED Indicator
LD5	A	-	Active LED Indicator
LD6	D	-	Duplex LED Indicator
LD7	L	-	Link LED Indicator
LD8	S	-	Speed LED Indicator
JP1-JP5	COMM SEL	Right	Communication Interface Selection SPI/UART: Left position SPI, Right position UART
T1	BOOT	-	Boot Button
T2	RUN	-	ON/OFF Button

ETH WIZ 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	5	-	V
Ethernet Data Rate		10/100		Mbps

Software Support

ETH WIZ 3 Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a mikroBUS™ socket.

Example Description

This example demonstrates the use of the ETH WIZ 3 Click board in TCP client mode using the module AT command interface. The device is configured to use DHCP, connect to a remote TCP echo server, and periodically send a predefined message. When the TCP connection is active, the application transmits the message and displays the received echo response on the serial terminal.

Key Functions

- ethwiz3_cfg_setup This function initializes Click configuration structure to initial values.
- ethwiz3_init This function initializes all necessary pins and peripherals used for this

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISOQAR REGISTERED
UKAS MANAGEMENT SYSTEMS
ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.
TÜV SÜD ISO 9001
ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

Click board.
- ethwiz3_cmd_set This function sends a two-character command followed by the input data string and a CRLF termination.
- ethwiz3_cmd_get This function sends a two-character command terminated with CRLF and reads back the response data.
- ethwiz3_data_write This function writes a raw data buffer of the specified length.
- ethwiz3_data_read This function reads raw data into the provided buffer.

Application Init

Initializes the logger and ETH WIZ 3 Click driver, resets the device to AT mode, reads and displays basic device information (MAC address, firmware version, product name), configures the TCP client parameters (DHCP, remote host IP/port), saves settings, and reboots the device to data mode.

Application Task

Monitors the TCP connection status pin and reports changes. When the connection is active, the application sends the predefined message to the remote server and prints the received response.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter. For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

ETH WIZ 3 click example package

ETH WIZ 3 click 2D and 3D files v102

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).

MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

[W55RP20 datasheet]

[ETH WIZ 3 click schematic v102]

Mikroe produces entire development toolchains for all major microcontroller architectures.
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.

ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.

ISO 9001: 2015 certification of quality management system (QMS).