

WIZNET MAGAZINE

WIZ Mag

ioNIC & EVB-Pico2 Special Edition 2024

IoT Network Accelerator

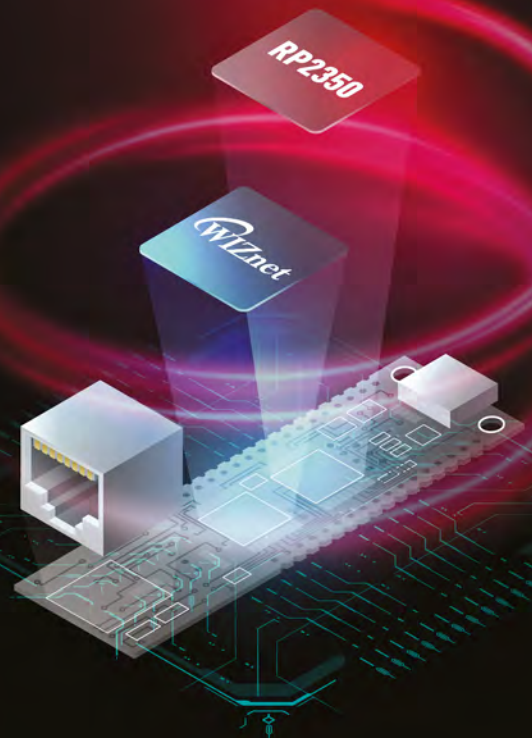
ioNIC

Co-Processor



EVB-Pico2

Family boards



1

What is ioNIC?

(Ethernet + MCU)

By Matthew



Innovating Embedded Device Communication with Smart Ethernet Chips

The ioNIC is an innovative chip that not only provides the stability and reliability of Ethernet but also features customizable options to meet the diverse needs of users. It evolves from the traditional TCP Offload Ethernet chips, incorporating a stable TCP Offload capability along with various additional functionalities. This chip empowers you to bring your creative ideas to life, enabling a multitude of functions within a single chip.

Enhanced performance, tailored scalability! ioNIC transcends the boundaries of TCP Offload.

ioNIC focuses on enhancing customer MCU performance and efficiency, supporting not just standard TCP Offload functions but also enabling a variety of applications, security measures, and encryption processing.

TCP Offload	Like previous WIZnet Ethernet products, it uses an integrated TCP/IP to ensure stable, efficient communications with low latency, unaffected by external conditions.
Multiple Network Protocols	ioNIC can handle various network protocols. For example, it can manage protocols like HTTP, FTP, and MQTT, reducing the load for applications such as web servers, file transfers, and sensor data transmission.
Security and Encryption	ioNIC can handle SSL/TLS and encryption tasks, bolstering secure communications. This ensures data safety and meets stringent security requirements.
Application Processing	It can manage tasks specific to certain network applications, supporting operations like video and audio streaming, online gaming, and real-time data analysis.
Data Caching and Acceleration	By caching and accelerating data, ioNIC can enhance application performance. This reduces the memory and time burden on MCUs while maintaining stable communication with servers.
ioNIC propels your business forward! Realize the implementations you desire now.	
With the customizable ioNIC and its hardware-based TCP/IP stack, you can implement functions such as:	
Cloud Connectivity	ioNIC connects to a secure cloud, encrypting and safely transmitting data collected by the MCU. The MCU simply needs to transmit data using the desired pins (UART, SPI, I2C, GPIO).
OTA Updates	ioNIC can update not only its internal firmware but also that of the MCU. MCU-less Application Implementation: ioNIC can perform MCU functions, providing an all-in-one solution for application development with integrated Ethernet TCP/IP, Phy chip, Flash, and MCU.
Low Latency/Stable Protocol Implementation	It can implement applications requiring stable communication with low latency, such as audio, video, and industrial applications.
Custom Protocol Implementation	Custom protocols can be tailored for specific domains or use cases, providing optimized solutions that meet unique requirements and offer added value to customers.
Embedded Web Server	With an embedded web server in the device, users can access, monitor, and control the device status through a web browser.

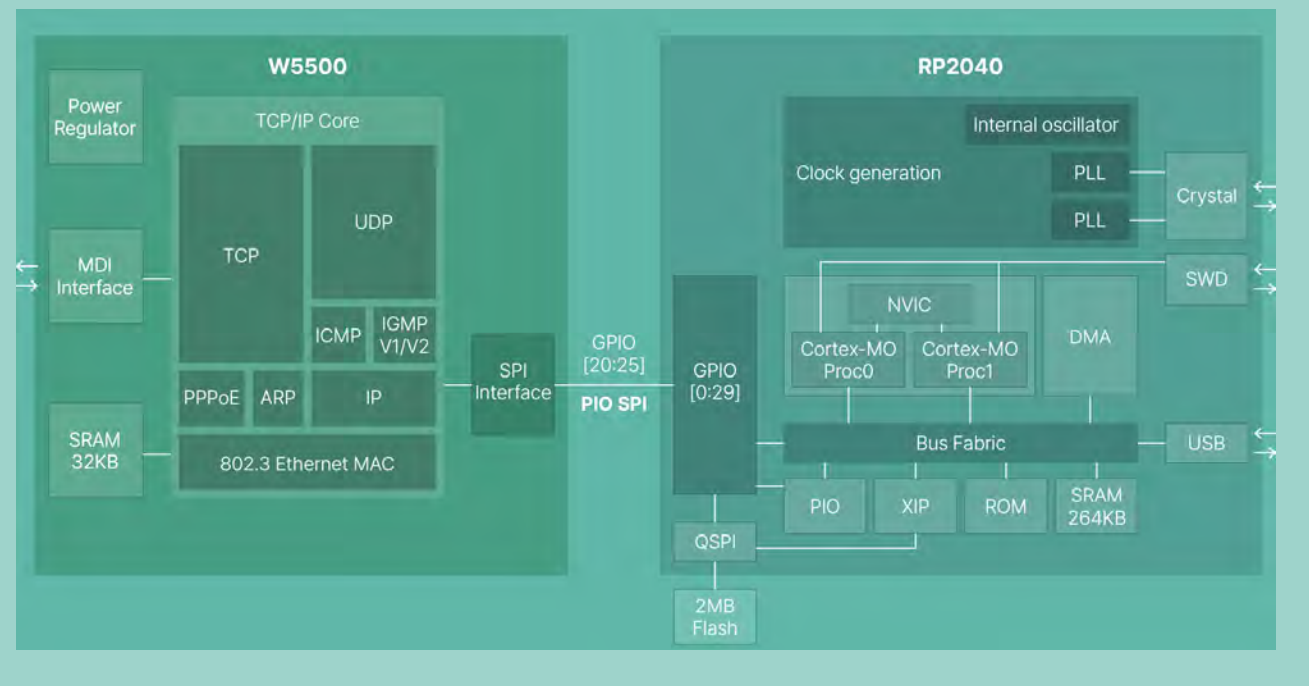
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What is W55RP20?

(Ethernet + RP2040)



By Scott



The W55RP20 chip is a System-in-Package (SiP) solution that integrates WIZnet's W5500 Ethernet controller with the RP2040 microcontroller from Raspberry Pi, providing robust networking and processing capabilities for IoT devices and smart applications. The W5500 supports a hardware TCP/IP stack, simplifying network connectivity and communication management, and offers an efficient solution without the need for external memory. The RP2040 features a dual-core ARM Cortex-M0+ processor, enabling fast data processing and multitasking capabilities to handle multiple tasks simultaneously.

Designed with versatility in mind, this chip is ideal for a wide range of users, including makers, hobbyists, and professional developers who require a reliable and integrated solution for their projects. Makers and hobbyists will appreciate the chip's ease of use and compatibility with popular programming environments such as Python and C/C++, allowing for quick prototyping and experimentation. Professional developers, particularly those working in the IoT and industrial automation sectors, will find the chip's robust network capabilities, low power consumption, and high-performance processing particularly advantageous for creating reliable, scalable, and cost-effective solutions.

The W55RP20 chip's strengths lie in its comprehensive feature set that caters to diverse application needs. It supports various external interfaces such as GPIO, ADC, UART, SPI, and I2C, which facilitate connections with sensors, actuators, and other peripheral devices. This flexibility makes it an excellent choice for developing smart home devices, industrial automation systems, and networked sensors, where efficient and reliable data transmission is crucial.

W55RP20 features and peripheral counts

Peripherals		W55RP20
Flash memory in Mbytes		2Mbyte
SRAM in Kbytes		264kB on-chip SRAM in six independent banks
Timer	Watch Doge	1
	Timer	4
	PWM	Up to 16
Comm	UART	Up to 2
	SPI	Up to 2
	TCP/IP Socket	8
Internal PHY		Yes
GPIOs		23-GPIO pins
DMA channel		12ch
CPU frequency		Up to 133MHz
Operating voltage		1.8 to 5.5 DC
Operating temperatures		-20°C to 85°C+
Package		-

The main clock speed of the W55RP20 supports a CPU frequency of up to 133 MHz, and it has 2 MB of flash memory and 264 kB of SRAM built-in. It includes an integrated Ethernet PHY and is equipped with a total of 5 timers (1 Watchdog Timer and 4 General Timers).

This robust configuration ensures smooth and reliable performance across a wide range of applications, from simple sensor networks to complex, real-time control systems.

Additionally, the chip supports up to 16 PWM channels and up to 2 UART, SPI, and I2C communication interfaces. There are a total of 8 TCP/IP sockets, 23 GPIO pins, and 12 DMA channels, providing ample connectivity and control options for diverse application needs. The operating voltage range is from 1.8V to 5.5V, and the operating temperature range is from -20°C to 85°C, making it suitable for various environmental conditions and ensuring durability in different operational settings.

For specific information about the chip, please refer to the W55RP20 Datasheet. Furthermore, the comprehensive Software Development Kit (SDK) supports various development environments such as C/C++, MicroPython, CircuitPython, FreeRTOS, Arduino, and LwIP, and it provides protocol support for AWS, Azure, TLS, SSL, MQTT, and HTTP. This broad compatibility with different development tools and platforms ensures that developers have the flexibility to choose the best tools for their specific projects, enhancing productivity and reducing development time.

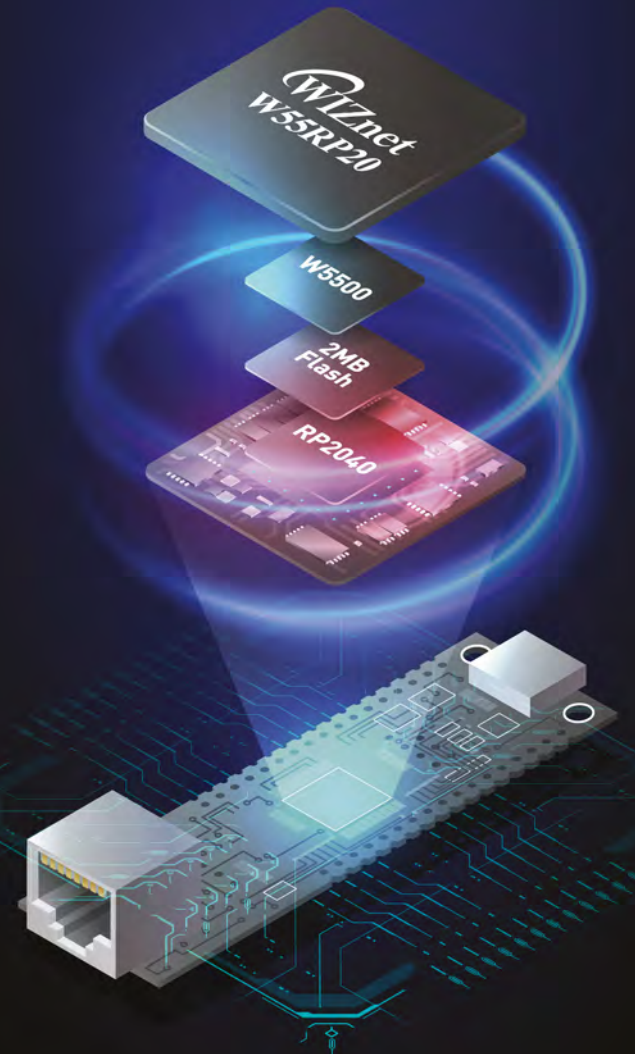
In summary, the W55RP20 chip is a powerful, flexible, and user-friendly solution that meets the needs of a wide range of users, from hobbyists to professional developers, by offering a comprehensive set of features tailored for the growing IoT and smart application markets.

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W55RP20 EVB-Pico

(with PoE)

By Alan



Features

- Although the board has identical pinout with Pico board, there are only 19 GPIO pins available
- Industrial temperature (-45°C ~ 85°C)
- Wide Voltage Level Input : 1.8 V ~ 5.5V
- 3-pin ARM Serial Wire Debug(SWD) port
- 10 / 100 Ethernet PHY embedded
- Supports Auto Negotiation
 - Full/Half Duplex
 - 10/100 Based
- Built-in RJ-45 (PoE)
- Built-in DCDC (PWM/PFM)

Introduction

The W55RP20-EVB-Pico is an exciting evaluation board that brings together the best of two worlds. By combining the W5500 wired TCP/IP controller with the Raspberry Pi RP2040 microcontroller, this board lets you tap into the powerful networking features of the W5500 while enjoying the versatility and ease of use of the Raspberry Pi Pico. Whether you're diving into Ethernet-based projects or exploring the RP2040's capabilities, this board offers a seamless experience that's both functional and fun to work with.

This board is designed for developers, hobbyists, and educators who are looking to explore Ethernet connectivity in their projects. Its compatibility with the Raspberry Pi Pico pinout ensures an easy transition for those already familiar with the Pico platform. Additionally, the inclusion of Power over Ethernet (PoE) functionality allows the board to be powered directly through an Ethernet cable, which is perfect for projects in remote locations where traditional power sources may not be available.

Differences from traditional W5500-EVB-Pico

- Four LEDs, LINK, ACT, DPX, and SPD, indicate the current status of Ethernet.
- A PoE module can be installed to provide stable power. (Up to 15W PoE available)
- C-Type USB connectors are available.
- Stable, sturdy Boot, Reset Switch
- PWM, PFM mode of DCDC can be set

Enhanced Usability

The W55RP20-EVB-Pico is also equipped with features that improve its usability for various projects. The four status LEDs for Ethernet provide immediate visual feedback, making it easier to monitor and troubleshoot network activity. The stable Boot and Reset switches ensure reliable operation during development and deployment, reducing the chance of accidental resets or interruptions.

Applicable PoE module



WIZPoE - P1

- IEEE802.3af compliant
- Mode A(Endspan), Mode B(Midspan)
- Wide input voltage range 40Vdc ~ 60Vdc
- High DC/DC conversion efficiency
- Isolation
- Internal build in 2 channel bridge rectifiers

Conclusion

In summary, the W55RP20-EVB-Pico offers a powerful and flexible platform for anyone interested in Ethernet-based projects. Its combination of networking capabilities, PoE support, and compatibility with the Raspberry Pi Pico ecosystem makes it a versatile choice for a wide range of applications.

4

Exploring the New Raspberry Pi RP2350

By Viktor



New

The Raspberry Pi has introduced the RP2350, a significant advancement over the popular RP2040 microcontroller. While the RP2040 was celebrated for its affordability and flexibility, the RP2350 offers enhanced performance, improved security features, and greater efficiency, making it ideal for more demanding applications.

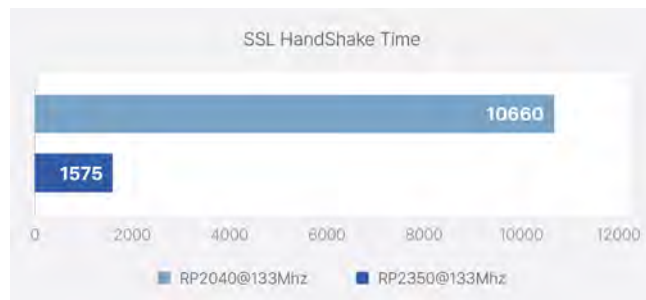
RP2350 vs. RP2040: Key Improvements

The RP2350 brings several noteworthy upgrades:

- 1. Processing Power** : Equipped with two 150MHz Arm Cortex-M33 cores, the RP2350 offers better performance than the RP2040's dual Cortex-M0+ cores, with additional floating point and DSP support for complex tasks.
- 2. Memory Architecture** : The RP2350 includes 520KB of on-chip SRAM, split into ten concurrently accessible banks, allowing for more complex and memory-intensive applications.
- 3. Power Management** : The RP2350's on-chip switch-mode power supply and low-quiescent-current LDO optimize power consumption, ideal for energy-efficient, battery-operated devices.

Accelerated Security with the RP2350

The RP2350's comprehensive security architecture, featuring Arm TrustZone and hardware-accelerated cryptography, significantly enhances the efficiency and security of tasks such as SSL/TLS encryption. The following graph demonstrates the RP2350's reduced SSL connection time compared to the RP2040, highlighting its capability to handle secure transactions more efficiently.



Conclusion

The Raspberry Pi RP2350 offers substantial upgrades over the RP2040, with enhanced processing power, advanced security, and energy-efficient design. These features make the RP2350 a powerful choice for developing secure, efficient applications, especially when paired with WIZnet's PSA certified SDK.

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WIZnet EVB Pico 2 Launch

By Benjamin

Introduction

The WIZnet EVB Pico 2 series is designed to simplify and enhance Ethernet connectivity in embedded systems. By integrating WIZnet's industry-leading Ethernet controllers (W6100, W5500, and W5100S) directly onto the board, these evaluation boards eliminate the need for additional components or connections, offering a streamlined solution for developers. Ideal for IoT projects, industrial automation, and secure communications, the EVB Pico 2 series provides reliable, high-performance Ethernet capabilities in a compact form factor.

Features

- Integrated Ethernet Solution** : The WIZnet EVB Pico 2 series seamlessly integrates WIZnet's W6100, W5500, and W5100S Ethernet controllers onto a single board, enabling stable and low-latency Ethernet communication without the need for external modules or complex wiring.
- Simplified Development** : By combining the RP2350 microcontroller with WIZnet's Ethernet controllers, the EVB Pico 2 series reduces the complexity of hardware design, making it easier and faster to develop Ethernet-enabled applications.
- Flexible Connectivity Options** : With up to 48 GPIOs and support for multiple interfaces (UART, I2C, SPI, PWM), the EVB Pico 2 series is versatile enough to meet a wide range of application needs, from simple IoT devices to complex industrial systems.

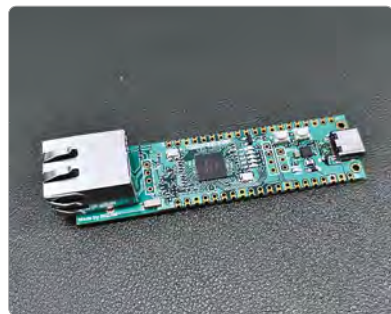
ioNIC (W55RP20) Contents

By Benjamin

Mason

Adding Ethernet to RP2040? Take a look at W55RP20

Alan



WIZnet's W55RP20 combines the RP2040 microcontroller with the W5500 Ethernet controller, supporting Ethernet or standalone RP2040 applications. It features TLS, PoE, and efficient power management. Paired with the W55RP20-EVB-Pico board, it offers USB Type-C, enhanced LEDs, and a DC-DC converter.

Maker URL
<https://maker.wiznet.io/Alan/projects/adding-ethernet-to-rp2040-take-a-look-at-w55rp20>



Alan

Compact PoE IP Camera with WIZnet's W55RP20

A compact PoE IP camera using WIZnet's W55RP20 chip, which combines the RP2040 microcontroller and W5500 Ethernet controller in one SiP package. The project features a custom PCB with PoE support and an integrated Arducam camera module, resulting in a small, efficient IP camera. This demonstrates the W55RP20's potential for innovative, power-efficient IoT and embedded applications.

Maker URL
<https://maker.wiznet.io/Alan/projects/a-really-small-poe-ip-camera>



Alan

Introducing W232N: A Compact RS-232 to Ethernet Converter Powered by W55RP20



The W232N is WIZnet's latest RS-232 to Ethernet converter featuring the W55RP20 chip, housed in a durable metal case. Its fully insulated RS-232 interface provides robust electrical isolation through an isolated DC-DC converter and transceiver. Despite its advanced insulation, the compact device supports PoE at a competitive price. With support for Modbus, MQTT, and a built-in web server for easy management, the W232N offers great value at \$39.50.

Maker URL
<https://maker.wiznet.io/Alan/projects/w232n-review-rs-232-ethernet-converter>



How to build WIZnet-ioNIC-micropython



Learn how to build WIZnet ioNIC with MicroPython in this project, which guides you through setting up and running MicroPython on the WIZnet ioNIC chip. It offers step-by-step instructions for integrating the chip with network applications, enabling efficient development for IoT and embedded systems using WIZnet's versatile technology.

Maker URL
<https://maker.wiznet.io/mason/projects/how-to-build-wiznet-ionic-micropython/>

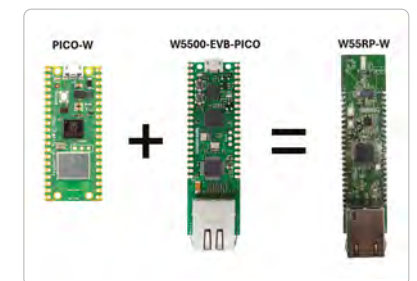


Jaden

Pico-W + W5500 in one module!

This project demonstrates how to combine the Raspberry Pi Pico W and W5500 Ethernet controller into a single module. It provides a detailed guide for integrating Wi-Fi and Ethernet connectivity in one solution, offering enhanced versatility for IoT and embedded applications. Ideal for developers looking to add reliable Ethernet support alongside wireless capabilities.

Maker URL
<https://maker.wiznet.io/jaden/projects/pico-w-w5500-in-one-module/>



Bruno

W55RP20-EVB-Pico: Integrating W5500 TCP/IP Controller with RP2040



This study explores the impact of reference voltage fluctuations on the RP2040's internal temperature sensor accuracy within the W55RP20 SiP chip. Results indicated significant temperature reading discrepancies with varying reference voltages, compromising reliability.

Maker URL
<https://maker.wiznet.io/bruno/projects/test-of-reference-voltage-change-of-rp2040-internal-temperature-sensor-of-sip-chip-w55rp20/>

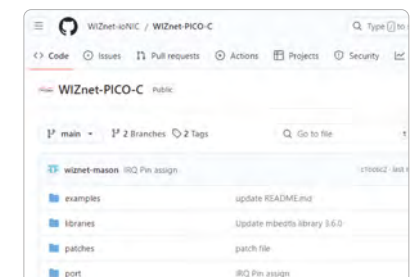


Grace

W55RP20-EVB-PICO Loopback example with PICO-C

Explore the networking features of the W55RP20-EVB-Pico by running loopback examples from the WIZnet-ioNIC GitHub repository. This project shows you how to set up and execute TCP server, TCP client, and UDP loopback functions using PICO-C, highlighting the capabilities of the RP2040 microcontroller paired with WIZnet's W55RP20 Ethernet chip.

Maker URL
https://maker.wiznet.io/Grace_Koo/projects/w55rp20-evb-pico-loopback-example/





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