# IoTsmart ESP32-S3

IoTsmart ESP32-S3: The Next Evolution in Connectivity

Discover new possibilities in connectivity and performance with our latest module, meticulously engineered around **Espressif's** cutting-edge **ESP32-S3** microcontroller. This powerful System-on-Chip (SoC) isn't just a component; it's the core of a solution engineered to truly push the boundaries of what's achievable in embedded systems.
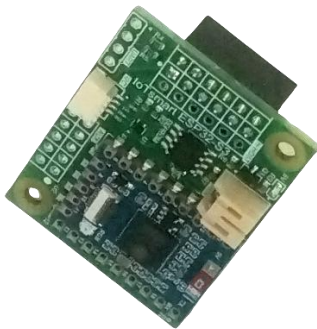

The **ESP32-S3** stands out with its **Xtensa® 32-bit LX7** dual-core processor, clocking in at up to 240 MHz, 512KB of SRAM and 384KB ROM, onboard 2MB PSRAM and 4MB Flash memory. This translates to serious processing power, ready to efficiently tackle even your most demanding applications. What truly makes the **ESP32-S3**—and by extension, our module—a transformative force is its robust wireless suite. With integrated 2.4 GHz Wi-Fi (802.11 b/g/n) and Bluetooth® 5 (LE), you're equipped with reliable, versatile communication options right from the start.

The **IoTsmart ESP32-S3** module offers native support for popular IoT platforms. Comprehensive examples for **Node-RED** and **Blynk** are actively maintained to help accelerate your project development

Whether you're innovating in IoT, crafting smart home solutions, or deploying complex industrial controls, the **IoTsmart ESP32-S3** connects seamlessly with **IoTextra** series expansion boards (mezzanines) via a 12-pin HOST connector. Essentially, this module upgrades standard mezzanines into intelligent, programmable smart modules.

The module offers two orientations for the **HOST** connector:

- **H-HOST** (horizontal connector), mounted on the **top-side** of the module, designed for **vertical** mezzanine installation
- **V-HOST** (vertical connector), mounted on the **bottom-side** of the module, designed for **horizontal** mezzanine installation
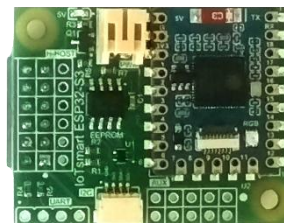
IoTsmart ESP32-S3 module with **H-HOST** connector (**top-side**)

IoTsmart ESP32-S3 module with **V-HOST** connector (**bottom-side**)

*Note: Some mezzanines, such as certain versions of the **IoTextra Relay2**, are too tall for the **V-HOST** connector.*

The module features a **Qwiic©** connector for **I²C** communication and supports optional **UART** and **AUX** connectors. These can be used to connect external sensors, devices, or access additional GPIO signals.

An onboard EEPROM (8 Kbit or 16 Kbit) stores configuration and user data and is accessible via **I²C** at addresses 0x54–0x57 by default.

The module incorporates **Waveshare ESP32-S3-Mini**, which provides:
- ESP32-S3FH4R2 chip with Xtensa 32-bit LX7 dual-core processor, up to 240MHz main frequency
- Built in 512KB of SRAM and 384KB ROM, onboard 2MB PSRAM and 4MB Flash memory
- Integrated 2.4GHz Wi-Fi and Bluetooth LE dual-mode wireless communication, with superior RF performance
- USB Type-C interface via the **Tiny Adapter Board**
- FPC 8-pin connector

The module is powered by a +5VDC input.

The **IoTsmart ESP32-S3** module measures 31 x 40 mm.

Common applications:

- Industrial automation
- Data logging and monitoring
- HVAC and lighting control
- Remote sensors
- Smart home solutions
- Consumer appliances

QUICK START

The **IoTsmart ESP32-S3** module is most frequently used with **IoTextra** series mezzanine. This combination allows the **IoTsmart ESP32-S3** module and a mezzanine to easily function as a standalone smart device.

The photos below illustrate the **IoTsmart ESP32-S3** module paired with various mezzanines and demonstrate both horizontal (**H-HOST**) and vertical (**V-HOST**) installation of the **HOST** connector:
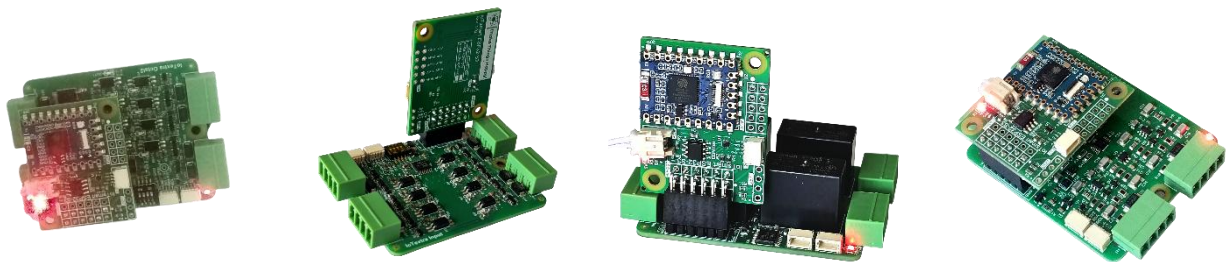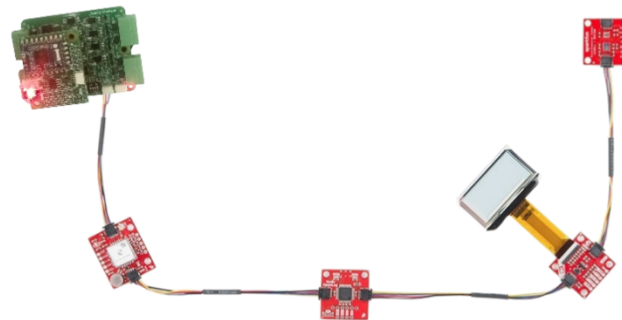

| Horizontal **IoTsmart ESP32-S3** with **IoTextra Octal2** | **IoTsmart ESP32-S3** with **IoTextra Input** | **IoTsmart ESP32-S3** with **IoTextra Relay2** | **IoTsmart ESP32-S3** with **IoTextra Analog** |

The **IoTsmart ESP32-S3** also readily connects to numerous **Qwiic©** compatible sensors, peripherals and modules via the **I²C** connector:

WAVESHARE ESP32-S3-MINI

The **IoTsmart ESP32-S3** module utilizes the **Waveshare ESP32-S3-Tiny**, which incorporates Xtensa 32-bit LX7 dual-core processor, up to 240MHz main frequency, 512KB of SRAM and 384KB ROM, onboard 2MB PSRAM and 4MB Flash memory.

ESP32-S3 microcontroller integrated 2.4GHz Wi-Fi and Bluetooth© LE dual-mode wireless communication, with superior RF performance.

It also includes an on-board FPC 8-pin connector, which adapts the USB Type-C port via the **Tiny Adaptor Board**.

The following photo displays the **Tiny Adaptor Board** with a cable; however, these are not included with the **IoTsmart ESP32-S3** and must be purchased separately:

For your information, here is the pinout of the [Waveshare ESP32-S3-Mini](#):
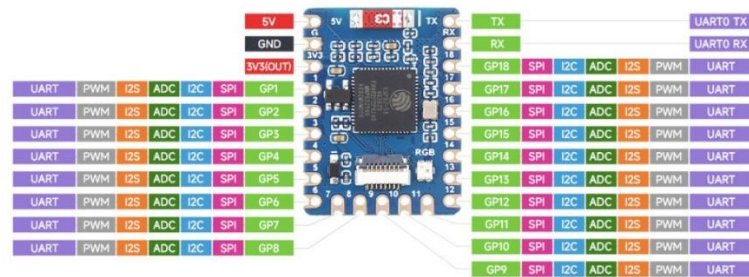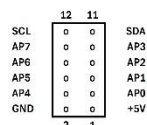

CONNECTORS

The module is equipped with the following connectors:

- **H-HOST** - horizontal (right-angle) connector installed on the **top-side**, designed for **vertical** mezzanine installation, **V-HOST** - vertical connector installed on the **bottom-side**, designed for **horizontal** mezzanine installation. Information regarding the type of the installed **HOST** connector is provided on the **bottom-side** of the module
- An **I2C** connector for connecting external sensors and devices via the **I²C** bus
- An optional 12-pin **AUX** connector, providing access to additional GPIO signals of the microcontroller (not pre-installed)
- An optional **UART** connector (not pre-installed)
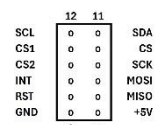- A **PWR** connector (+5VDC input)

HOST connector. Pinout of the **HOST** connectors:
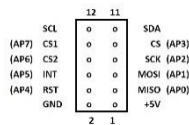
| **HOST** on the **IoTsmart** module | **HOST-P12** on the mezzanine | **HOST-S** on the mezzanine |

The **HOST** connector of the **IoTsmart ESP32-S3** module is inserted into the **HOST-12** or **HOST-S** connector on the mezzanine. Therefore, the pinout for the **HOST-P12** and **HOST-S** connectors on the mezzanines is also shown in the figure to compare the connector signals.
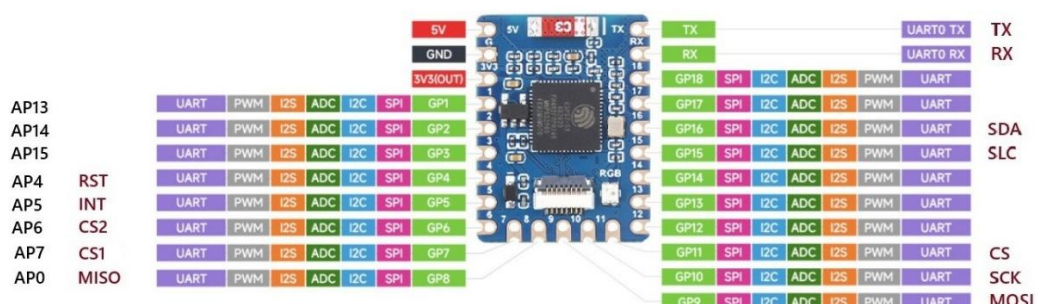
Auxiliary connector **AUX**. The structure of this connector is as follows:
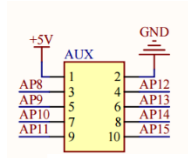
UART connector. The contacts of this connector are shown in the figure:
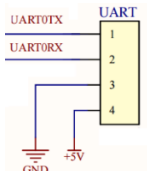
The **HOST**, **AUX** and **UART** connector signals correspond to the **Waveshare ESP32-S3-Tiny** signals as follows:

EEPROM

To store configuration and other user information, the **IoTsmart ESP32-S3** module includes an onboard **EEPROM** (8 Kbit or 16 Kbit). This **EEPROM** is accessible via the **I²C** bus and is visible at addresses 0x54-0x57 by default.

POWER SUPPLY

The module operates from a 5VDC power input supply. The power supply can be connected via a 2-pin **PWR** connector (JST S2B-PH-K-S, 2.00 mm pitch) or through the **Tiny Adapter Board**.

The typical power consumption of the module with the **Waveshare ESP32-S3-Tiny** is approximately 25 mA (measured without additional connected peripherals or expansion boards). The maximum current consumption, including power provided to a mezzanine, should not exceed 1000 mA.

LAYOUT

Below is the layout of the elements on the **top-side** of the **IoTsmart ESP32-S3** module when using the **HOST-H** connector:
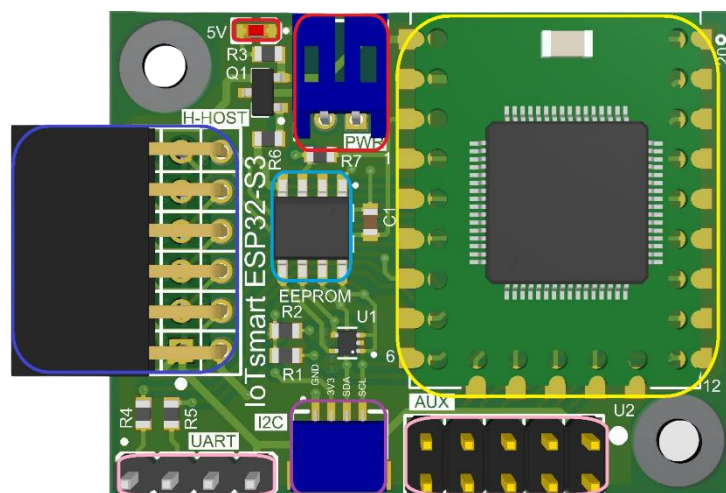
In this picture:

- Power-related elements (external power connector, named **PWR**, and **LED**) are highlighted in **red**
- The soldered **Waveshare ESP32-S3-Tiny** is highlighted in **yellow**
- The **HOST-H** connector is highlighted in **blue**
- **UART** and **AUX** connectors not installed during production are highlighted in pink
- The **Qwiic©** connector for connecting peripherals via the **I²C** bus is highlighted in **purple**
- EEPROM is highlighted in light blue

Below is the layout of the **IoTsmart ESP32-S3** module **bottom-side** when using the **HOST-V** connector (highlighted in **blue**):

JUMPERS

Jumpers are located on the underside of the module:

- **SB1**, **SB4**: Connect pull-up resistors to **I²C** SCL and SDA (enabled by default)
- **SB2**: Disables +3.3V power to devices when open (default: closed)
- **SB3**: Sets EEPROM **I²C** address

b7	b6	b5	b4	b3	b2	b1	b0
1	0	1	0	1	x	x	R/W

CONFIGURATION TABLES

The **bottom-side** of the module provides information about the type of **HOST** connector installed:

- **H-HOST** - horizontal (right-angle) connector installed on the **top-side**, designed for **vertical** mezzanine installation.
- **V-HOST** - vertical connector installed on the **bottom-side**, designed for **horizontal** mezzanine installation.

COMPATIBILITY WITH MEZZANINES

The **IoTsmart ESP32-S3** is compatible with all **IoTextra** mezzanines, including

- **IoTextra Input**
- **IoTextra Relay2**
- **IoTextra SSR Small**
- **IoTextra Octal2**
- **IoTextra Analog**
- **IoTextra Combo**

ACCESSORIES

Recommended accessories:

- 2-pin power connector
- **Tiny Adapter Board** with USB Type-C
- **Qwiic©** **I²C** cable (connector on both ends)