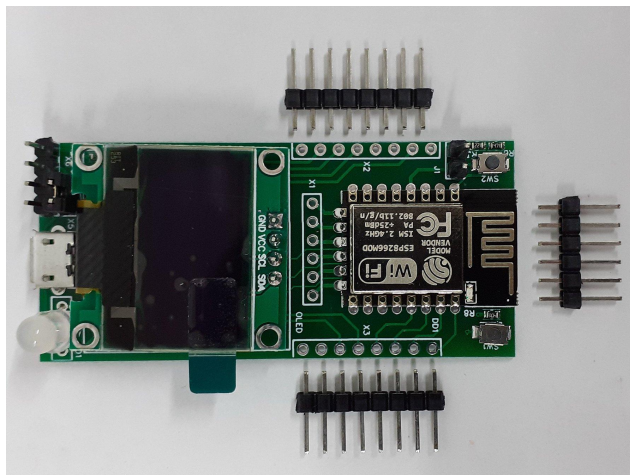


## ESP12.OLED - universal ESP8266 controller board with 0.96" I2C OLED and RGB LED



### Features

The board is universal and is used as a master controller. The ESP12.OLED is equipped with an ESP8266-12F, 32-bit, 60/180 MHz from Espressif Systems. The board layout provides the following functions:

- Data input/output using all available GPIOs of the ESP8266;
- Data output to the built-in RGB LED connected to the GPIO;
- The module is equipped with a built-in monochrome 0.96" OLED display with SSD1306 controller, 128x64 pixels, connected via I2C;
- Access to the I2C serial bus functions in Master device mode to connect any external devices supporting the I2C specification;
- Since all ports of the ESP8266 are on the board, the user can organize the rest of the interfaces and protocols supported by the ESP8266 as needed, such as I2C, PWM, SPI, UART, 1-Wire, 1-channel unipolar 10-bit ADC, ISR, True Random Number Generator, etc.

### Description

The ESP12.OLED\_V1 board is a ready-to-use 32-bit universal controller with a graphical display and interfaces for connecting digital and analog sensors and actuators.

This product is compatible with many modern platforms such as Arduino IDE, Platformio, ESPHome, MicroPython, Tasmota, NodeMCU, and many others. The user can freely choose the programming language and development environment: C/C++, Python, YAML, JS, Berry, Lua, and others.

### Application

The ESP12.OLED board will be conveniently used as a master controller for building both simple temporary testbeds for project hypothesis testing and commercial user devices in a stationary or pocket-sized design. Among such products, we can cite at least:

- electronic clocks,
- dosimeters of physical values,
- hubs and gateways,
- smart sockets,
- thermostats,
- weather stations, etc.

### Compatibility

Compatible with platforms:

- Arduino IDE Add-on for ESP8266;
- Espressif ESP-IDF;
- ESPHome firmware;
- NodeMCU firmware;
- MicroPython firmware;
- Tasmota firmware;
- integration into Home Assistant is possible (with the ESPHome plugin);

# ESP12.OLED\_V1

- And many other popular platforms:  
Blynk, Mongoose OS, PlatformIO.

## Contents

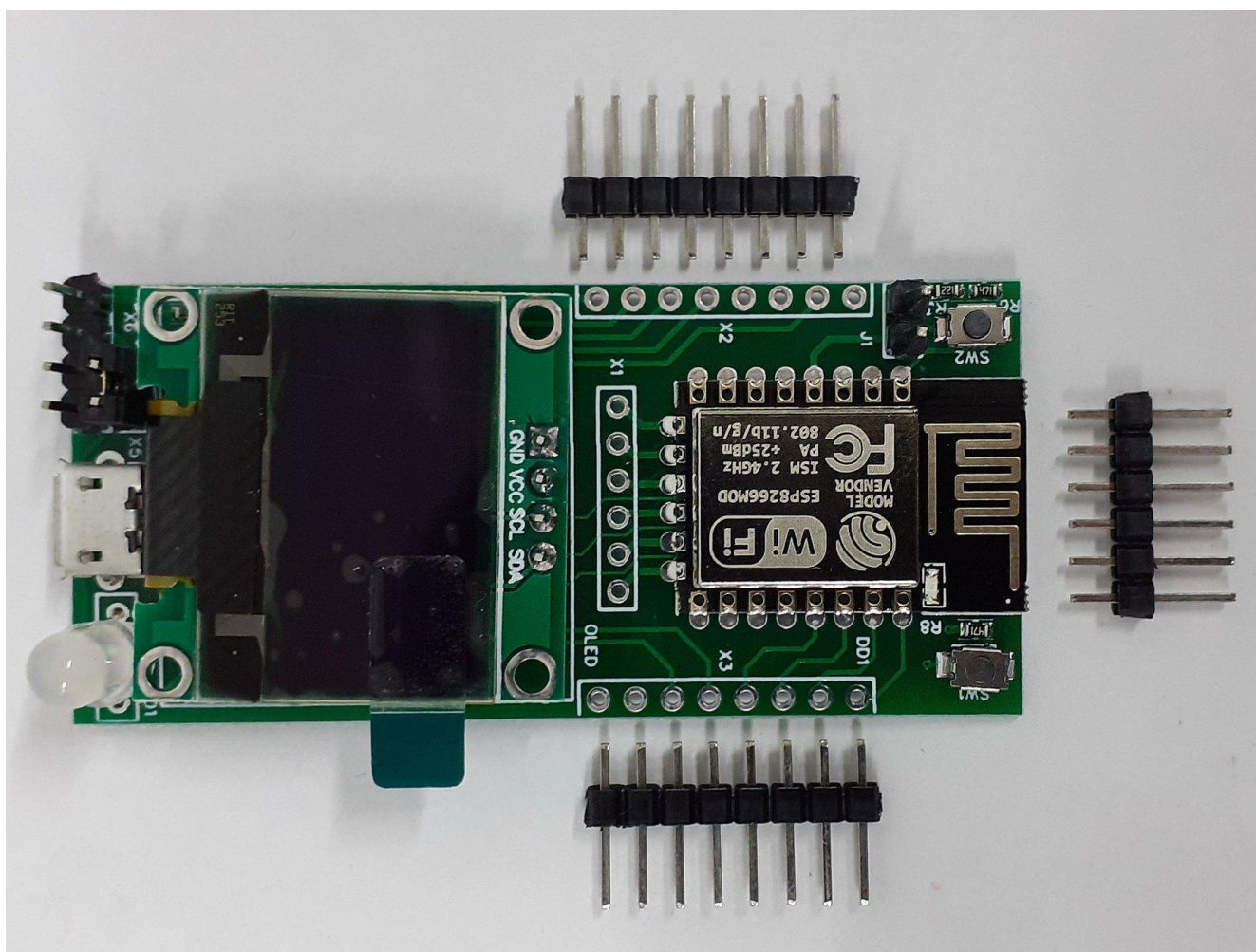
<b>ESP12.OLED - universal ESP8266 controller board with 0.96" I2C OLED and RGB LED</b>	<b>1</b>
Features	1
Description	1
Application	1
Compatibility	1
General description	4
Specifications and properties	5
Comparison of the ESP12.OLED board and the classic NodeMCU board	6
Support by platforms	7
Port assignment	8
Power supply modes and consumption	9
Schematic diagram of power supply and divider for ADC A0	9
OLED display address on the I2C bus	10
The size of the board	10
Supply kits	11
Links	12
From the manufacturer	12

## General description

The ESP12.OLED board is a programmable universal ESP8266 MCU controller with a graphical display and interfaces for connecting digital and analog sensors and actuators. It is used as a central module of IoT devices.

The controller board has:

- Holes on the PCB for GPIO connectors with a pitch of 2.54 mm;
- MCU ESP8266-12;
- Built-in SSD1306 128×64 monochrome 0.96" OLED I2C display;
- Built-in divider on the 10-bit ADC port (A0);
- Flash button (D3 / GPIO0 / P18);
- Rst button;
- RGB LED on GPIO (Red GPIO13 / Green GPIO12 / Blue GPIO14);
- Connection of the UART interface for testing and programming via the terminal console (USB-UART Bridge is used for programming, not included).







The ESP12.OLED can be integrated into systems based on Espressif, Arduino, or other family of devices with 3.3V or 5V power supply and 3.3V logic level.

The board has a built-in 3.3 volt regulator. The 5 to 6 volt DC input power is supplied via the micro USB connector or via the VCC and GND ports.

The ESP8266-12E(F) module has the specifications provided by AI-Thinker. All ports (I/O pins) of the ESP8266-12E(F) are duplicated on the board. The pitch between the holes of the I/O ports is 2.54 mm. The sequence of ports on the board is the same as the sequence of ports on the ESP826612E(F) module.

Demo software (IoT-devices Test Tools) is pre-loaded on the ESP8266 module to quickly test and demonstrate the basic technical functions of the ESP12.OLED module board. This software starts 10 seconds after power-up.

The user manual for this software is available in a separate document. Please see the link [ESP12.OLED Test Tools 1.0 Description](#).

## Specifications and properties

- The MCU properties correspond to the documentation for the ESP-12F module.
- To program the controller, connect the ESP12.OLED via the UART connector to a computer using a UART-USB interface converter on the CP2102 chip or equivalent.
- The average current consumption of the controller without connecting additional devices and active Wi-Fi is about 80 mA. In Deep Sleep mode, the average current consumption is 10uA.
- Current consumption with Wi-Fi turned off is no more than 10 mA.
- The maximum load level on the 3V3 board output (port) for external system elements is 500 mA.
- Set j1 to activate the deep sleep wake-up circuit.
  
- Selecting the power supply mode:

- install jumper X5 for 5V power supply via uUSB or X6 pins;
- otherwise, remove jumper X5 to select a 3V3 power supply via another X6 pin.

## Comparison of the ESP12.OLED board and the classic NodeMCU board

Compared to the NodeMCU module board, the ESP12.OLED module board has the following differences:

(1) Three inputs for power supply (mode selection: via jumper):

- 5V (via micro-USB connector) and 5V (via pins);
- or 3.3V (via pins).

(2) There is a recovery circuit from hibernation mode (via a jumper);

(3) Built-in RGB LED (3 x GPIO; but the user can use these ports for other tasks if the LED is not used);

(4) Built-in monochrome display 0.96" 128×64 OLED, SSD1306 (I2C);

(5) Built-in divider for measuring the module supply voltage at the micro USB input (5V);

(6) The USB-UART interface converter has been omitted. By excluding the USB-UART interface converter, without losing access to UART functions (via pins), the cost and size of the ESP12.OLED module board have been reduced.

	<b>ESP12.OLED</b>	<b>NodeMCU classic board</b>
Power supply selection	5V or 3.3V, jumper	Only 5V
Main controller	ESP8266-12F	ESP8266-12F
UART interface	Yes, Tx/Rx ports	Yes, Tx/Rx ports
Micro USB interface	Power supply only	Power and data
Deep Sleep Wake Up circuit	Yes, with a jumper	No, self-assembly
RGB LED	Integrated via 3 x GPIO	No
OLED display	Built-in, I2C	No
Divider and ADC port	Built-in, input up to 5.6V DC	No, only the port
The ports for I2C are defined	Yes, D1 SCL, D2 SDA	Not specified
I/O ports are soldered	Yes, pin-headers	Yes, pin-headers

## Support by platforms

The following platforms have announced support for the ESP8266 microcontroller:

<b>Platform</b>	<b>Link</b>
NodeMCU / Lua	<a href="https://github.com/nodemcu/nodemcu-firmware">https://github.com/nodemcu/nodemcu-firmware</a>
ESPHome	<a href="https://esphome.io/components/esp8266.html">https://esphome.io/components/esp8266.html</a>
Arduino	<a href="https://github.com/esp8266/Arduino">https://github.com/esp8266/Arduino</a>
Blynk	<a href="https://docs.blynk.io/en/blynk.edgent-firmware-api/supported-boards">https://docs.blynk.io/en/blynk.edgent-firmware-api/supported-boards</a>
Tasmota	<a href="https://tasmota.github.io/docs/About/">https://tasmota.github.io/docs/About/</a>
Tuya	<a href="https://developer.tuya.com/en/docs/iot/general-firmware-burning-for-other-chip-platforms?id=Kamckr2dn7ku7">https://developer.tuya.com/en/docs/iot/general-firmware-burning-for-other-chip-platforms?id=Kamckr2dn7ku7</a>
MicroPython	<a href="https://docs.micropython.org/en/latest/esp8266/quickref.html">https://docs.micropython.org/en/latest/esp8266/quickref.html</a>
ESP8266 RTOS SDK (ESP-IDF Style)	<a href="https://docs.espressif.com/projects/esp8266-rtos-sdk/en/latest/get-started/index.html">https://docs.espressif.com/projects/esp8266-rtos-sdk/en/latest/get-started/index.html</a>

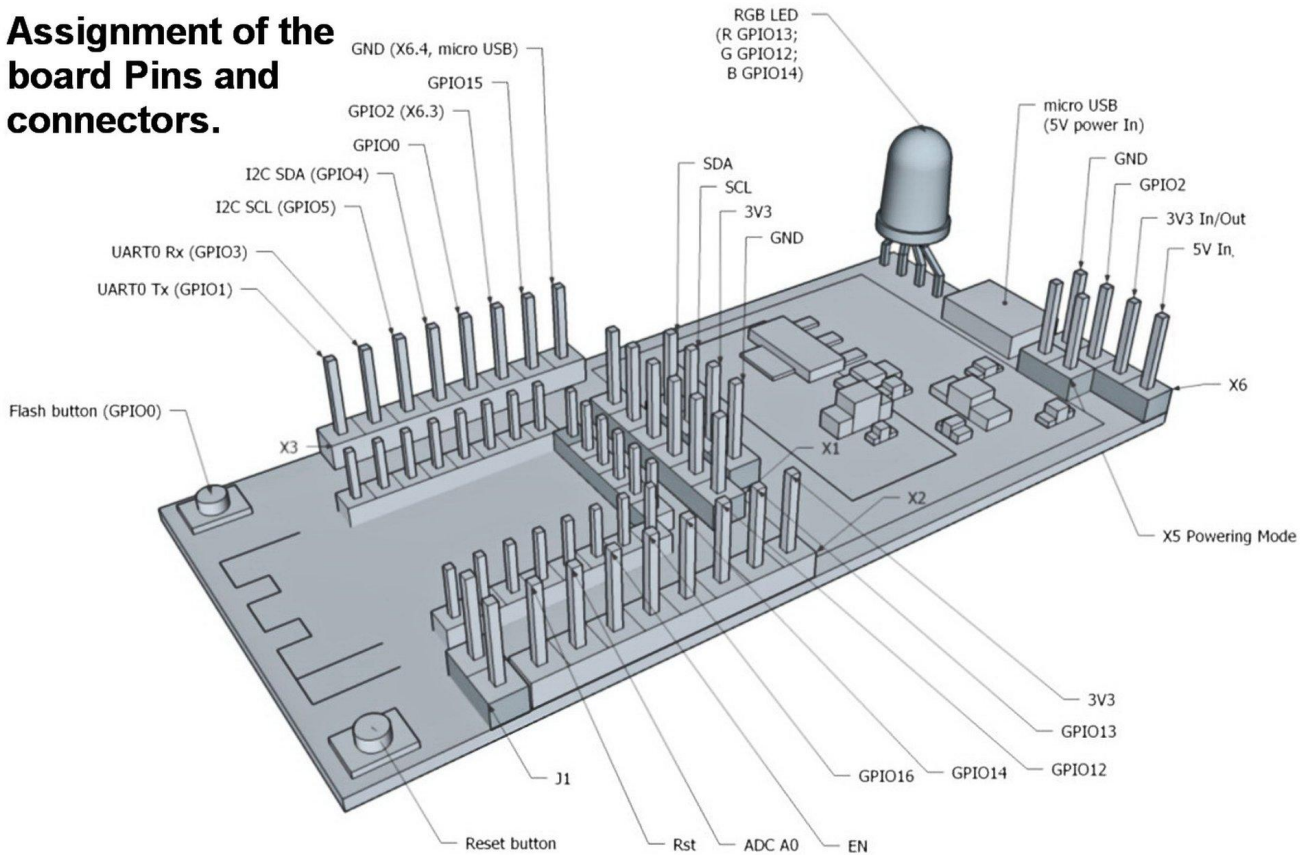
Technical note on using the ESP12.OLED\_V1 and GGreg20\_V3 modules with the ThingSpeak service as an example:

[https://iot-devices.com.ua/diy\\_geiger\\_counter\\_ggreg20\\_v3\\_and\\_esp12-oled\\_wiring\\_diagram\\_uk/](https://iot-devices.com.ua/diy_geiger_counter_ggreg20_v3_and_esp12-oled_wiring_diagram_uk/)

## Port assignment

The following figure shows (the ESP-12F controller module is not shown on purpose) the complete layout of the ports and jumpers of the ESP12.OLED\_V1 board:

### Assignment of the board Pins and connectors.



To ensure compatibility and ease of use, the ports on the ESP12.OLED\_V1 board completely repeat the purpose and location of the corresponding ports of the Ai-Thinker ESP12-F module according to the module manufacturer's data sheet:

[https://docs.ai-thinker.com/media/esp8266/docs/esp-12f\\_product\\_specification\\_en.pdf](https://docs.ai-thinker.com/media/esp8266/docs/esp-12f_product_specification_en.pdf)



## Power supply modes and consumption

Selecting the power mode:

The power supply is at a voltage level of 5 volts:

- set the jumper X5 for power supply via the uUSB input or via the X6 pin;

Power supply is at a voltage level of 3.3 volts:

- remove jumper X5 to select a 3V3 power supply via the X6 pin.

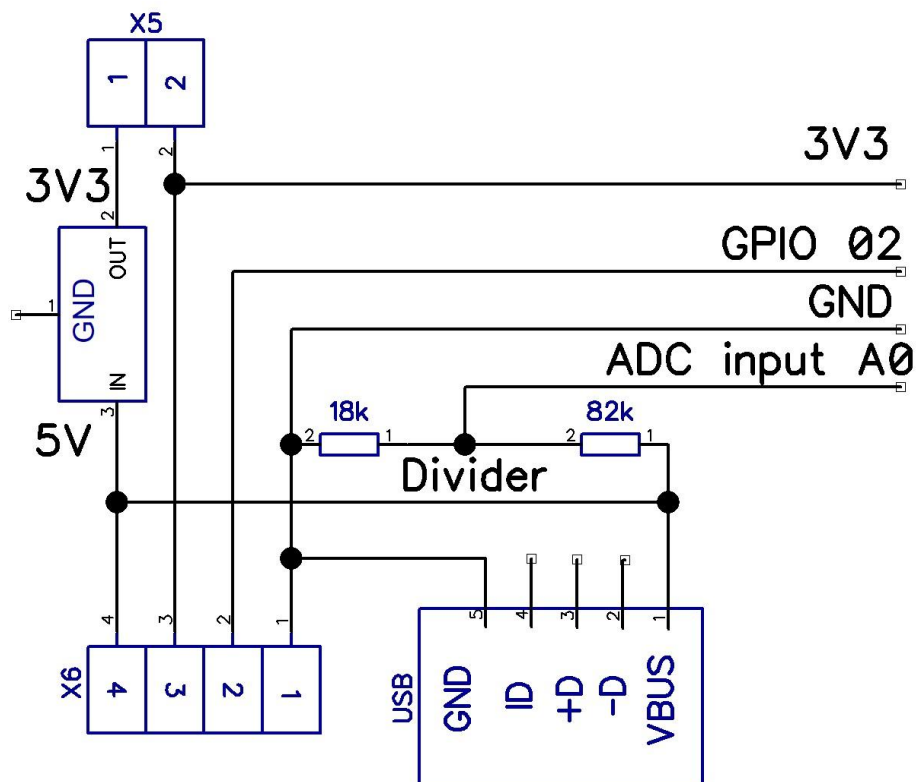
Consumption:

- The average current consumption of the controller without connecting additional devices and active Wi-Fi is about 80 mA.
- Current consumption with Wi-Fi turned off is no more than 10 mA.
- In Deep Sleep mode, the average current consumption is 10 uA.

## Schematic diagram of power supply and divider for ADC A0

In Fig. you can see the scheme of organization of the available power modes of the microcontroller on the board. Jumper X5 is responsible for setting the power mode.

The diagram also shows a divider that allows you to measure the voltage using the built-in ADC A0 at the board's power input, namely micro USB 5V. The divider is designed so that the range of values at the input of the ADC A0 is in the range of 0 - 1V at 0 - 5.6V at the micro USB input of the ESP12.OLED\_V1 board.



## OLED display address on the I2C bus

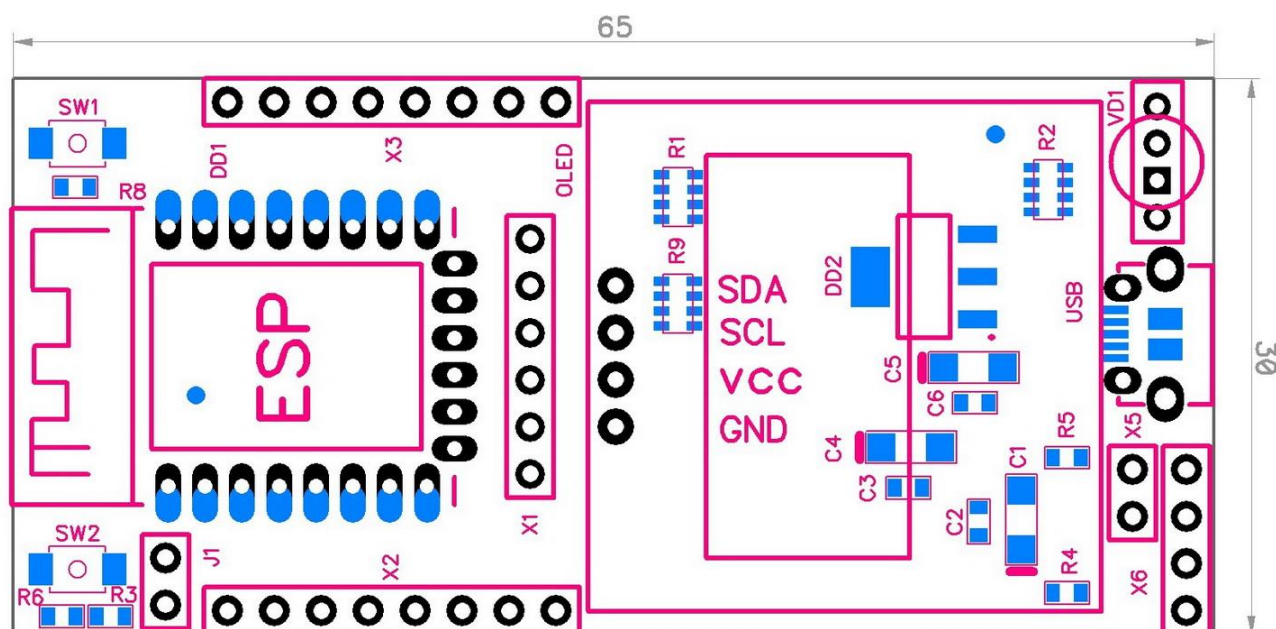
The address of the display module with the SSD1306 internal controller has a fixed address:

0x3c

In binary format, 7-bit:						
0	1	1	1	1	0	0

## The size of the board

- The module board dimensions are 30 x 65 x 10 mm.



## Supply kits

The module is supplied in the following sets:

- Ready-to-use board ESP12.OLED\_V1 - 1 pc;
- Jumpers - 2 pcs;
- PCB Headers ( Dupont Headers ) 2,54 22p - 1 шт.

### Notes:

The Ai-Thinker ESP-12 controller can be flashed with the manufacturer's stock firmware or with the ESP12.OLED Test Tools 1.0 firmware (see above).

A USB-UART converter for connection to a PC console is not included in the product.

## Links

Manufacturer's website	<a href="https://iot-devices.com.ua">https://iot-devices.com.ua</a>
Shop on Tindie	<a href="https://www.tindie.com/stores/iotdev/">https://www.tindie.com/stores/iotdev/</a>
Manufacturer's website for orders	<a href="https://iot-devices.com.ua/shop/">https://iot-devices.com.ua/shop/</a>
Facebook	<a href="https://www.facebook.com/IoT-devices-114746816966582">https://www.facebook.com/IoT-devices-114746816966582</a>
Twitter	<a href="https://twitter.com/iotdevicescomua">https://twitter.com/iotdevicescomua</a>
YouTube	<a href="https://www.youtube.com/channel/UCHpPOVVlbbdtYtvLUDt1NZw">https://www.youtube.com/channel/UCHpPOVVlbbdtYtvLUDt1NZw</a>
Email	<a href="mailto:info@iot-devices.com.ua">info@iot-devices.com.ua</a>

## From the manufacturer

Dear Reader! Thank you for your interest in our products. We hope that you will like this device as well. IoT-devices was born thanks to the support of our customers and thanks to our experience and love for Electronics.

Розроблено дизайн та виготовлено компанією IoT-devices зі свободою і мудрістю в Україні у 2021 році. Всі права застережено. Designed and made by IoT-devices with freedom & wisdom in Ukraine - 2021. All rights reserved.