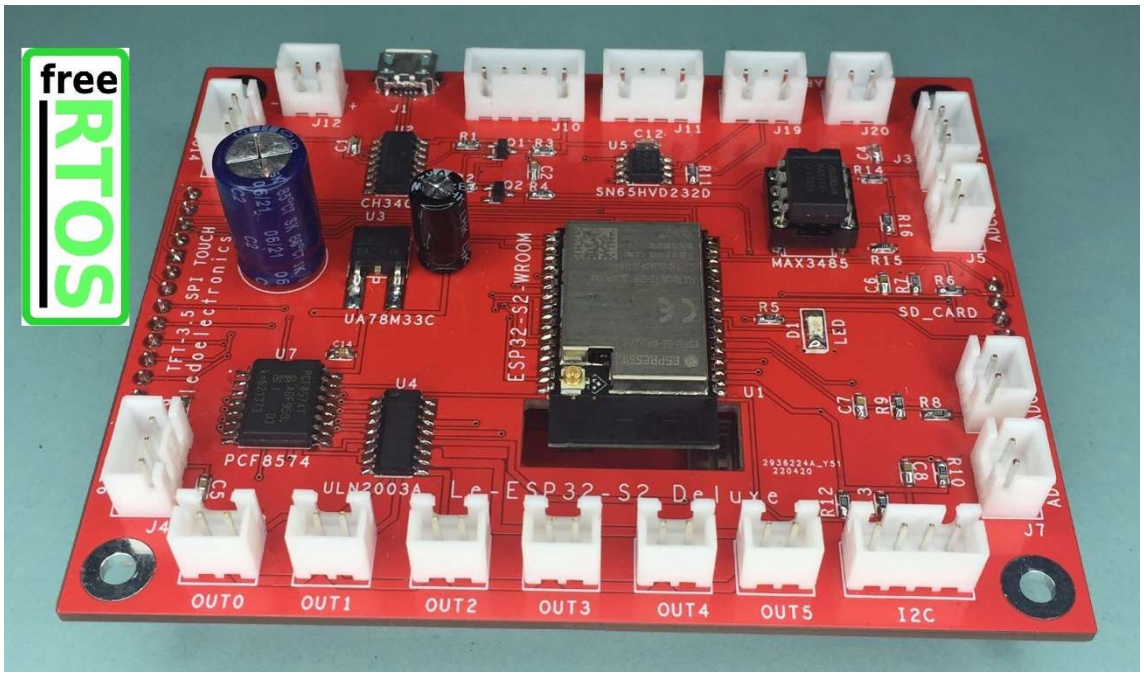
# IoT Module Le-ESP32-S2-Deluxe




- **For IoT application development, simple WEB server, TCP/IP station**
- **Powerful and compact control system based on Espressif's ESP32-S2 32-bit microcontroller**
- **240 MHz 32-bit CPU, 320 KB RAM, 4 MB Flash**
- **Digital and analog inputs and outputs**
- **3.5" color TFT touch screen 480 x 320 pixels. ILI9488 and AD7843 drivers**
- **Socket for SD Card**
- **WIFI, USB, I2C, SPI, CAN Bus and RS485 / UART communications**
- **Connectors for rotary encoder and two pushbuttons**
- **Programming from PC via USB port**
- **Compatible with Espressif, Arduino, PlatformIo, etc. IDEs.**
- **Compatible with IoT platforms from Google and Amazon among others**
- **Supply voltage: 3.5V...12V DC / 100 mA**

The module is based on the Espressif Systems ESP32-S2 32-bit Wi-Fi processor, specifically it uses the ESP32-S2-WROOM module, with PCB antenna and coaxial connector for external antenna.

The Le-Esp32-S2-Deluxe module is powered by applying a voltage between 3.5V and 12V DC to connector J12, the polarity is indicated on the board. The micro USB connector is used only for programming the microcontroller.

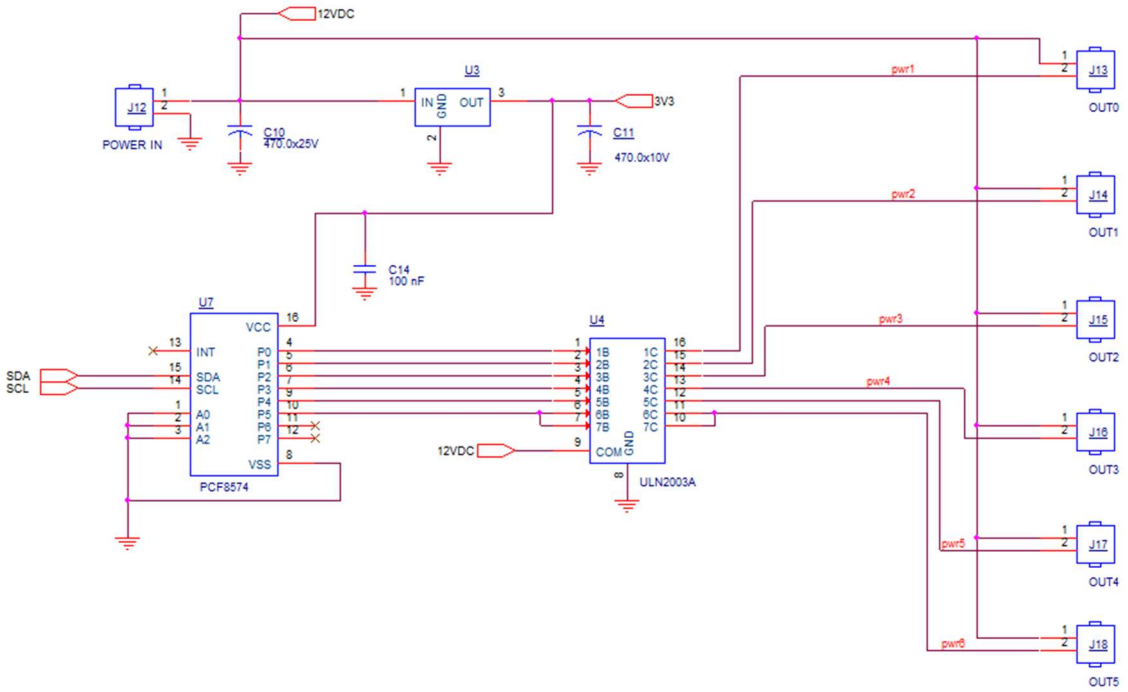
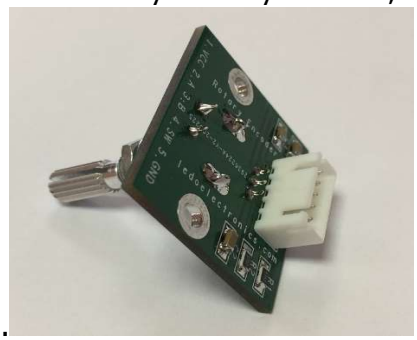



Fig.1. Power circuit and digital I/O.

Fig.1 shows the digital inputs/outputs available on the module. Many of the microcontroller pins have been used to control the various peripherals present on the board such as TFT Display, Touch Screen, SD Card, communication buses, etc. Therefore, we have added the PCF8574 expander controlled by the I2C bus.

The first six outputs of U7 are passed through the transistor array (U4), and are intended for the control of relays and solenoid valves with a nominal voltage of 12V, and a consumption of up to 500mA.

The J3 connector is intended to be used by a rotary encoder, with its 3.3V supply, and the signals A, B and Ok button.



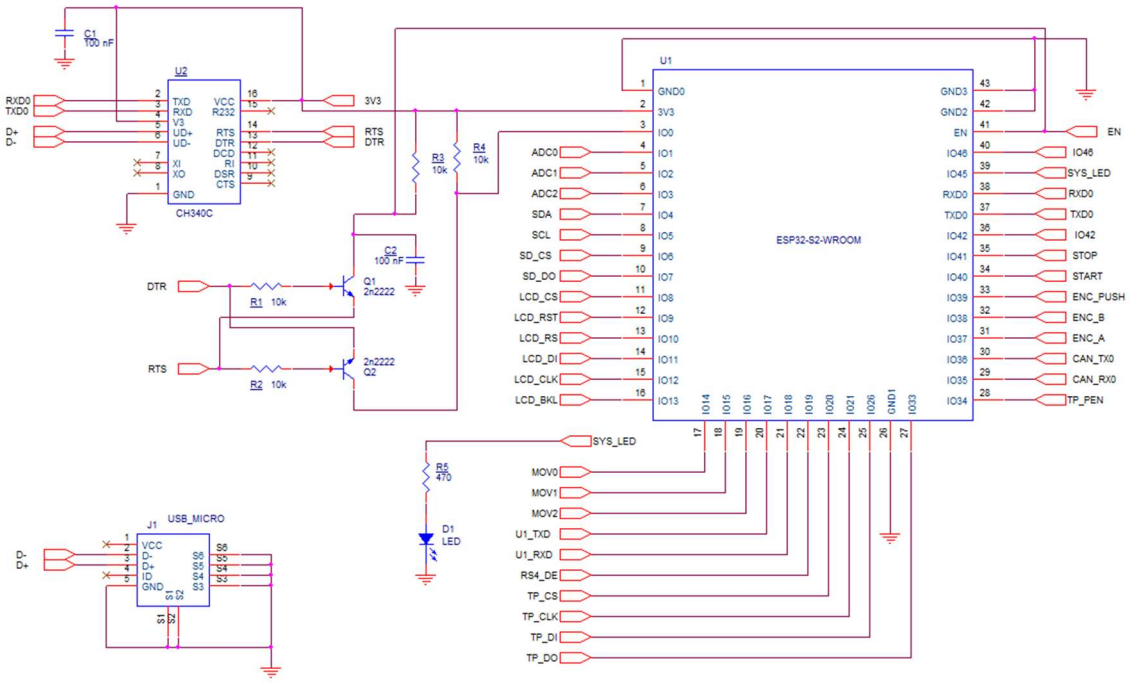



Fig.2. CPU and USB programming circuit.

The IC U5 and the transistors Q1 and Q2 allow the automatic programming of the ESP32-S2 microcontroller, from the Espressif, Arduino and PlatformIO IDEs, so that to load the project it is only necessary to power the module and connect it to the PC through a USB Cable. In these development environments, one of the ESP32-S2-WROOM, NODEMCU-32-S2, etc. boards should be chosen.

ESP32-S2 resource usage table

| **ESP32-S2 PIN** | **USAGE** | **CONECTOR** |
|---|---|---|
| IO04 | I2C SDA | J21-1 |
| IO05 | I2C SCL | J21-2 |
| 3V3 | POWER | J21-3 |
| GND | GND | J21-4 |
| IO45 | SYSTEM LED | |
| IO35 | CAN RX (SN65HVD232) | J19-1 (CAN H) |
| IO36 | CAN TX (SN65HVD232) | J19-2 (CAN L) |
| GND | GND | J19-3 |
| IO18 | UART RX / RS485 | J20-1 (RS485 A) |
| IO17 | UART TX / RS485 | J20-2 (RS485 B) |
| IO19 | RS485 DE | |
| IO08 | LCD CS | J8-3 |
| IO09 | LCD RST | J8-4 |
| IO10 | LCD DC | J8-5 |
| IO11 | LCD DI | J8-6 |
| IO12 | LCD CLK | J8-7 |
| IO13 | LCD BKL | J8-8 |

| | | |
|---|---|---|
| IO21 | TP CLK | J8-10 |
| IO20 | TP CS | J8-11 |
| IO26 | TP DI | J8-12 |
| IO33 | TP DO | J8-13 |
| IO34 | TP PEN | J8-14 |
| IO06 | SD CS / SPI CS | J9-1 |
| IO11 | SD DI (LCD DI) / SPI MOSI | J9-2 |
| IO07 | SD DO / SPI MISO | J9-3 |
| IO12 | SD CLK (LCD CLK) / SPI CLK | J9-4 |
| IO40 | BUTTON START | J11-1 |
| IO41 | BUTTON STOP | J11-2 |
| GND | GND | J11-3 |
| GND | GND | J11-4 |
| 3V3 | ENCODER PWR | J10-1 |
| IO37 | ENCODER A | J10-2 |
| IO38 | ENCODER B | J10-3 |
| IO39 | ENCODER PUSH | J10-4 |
| GND | ENCODER GND | J10-5 |
| 3V3 | POWER | J2-1 |
| IO14 | INPUT / OUTPUT | J2-2 |
| GND | GND | J2-3 |
| 3V3 | POWER | J3-1 |
| IO15 | INPUT / OUTPUT | J3-2 |
| GND | GND | J3-3 |
| 3V3 | POWER | J4-1 |
| IO16 | INPUT / OUTPUT | J4-2 |
| GND | GND | J4-3 |
| IO01 (ADC0) | ENTRADA ANALOGICA | J5-1 |
| GND | GND | J5-2 |
| IO02 (ADC1) | ENTRADA ANALOGICA | J6-1 |
| GND | GND | J6-2 |
| IO03 (ADC2) | ENTRADA ANALOGICA | J7-1 |
| GND | GND | J7-2 |

Using the PCF8574 expander

| **PCF8574 IO** | **USO** | **CONECTOR** |
|---|---|---|
| | 12V DC | J13-1 |
| P0 | SALIDA RELE | J13-2 |
| | 12V DC | J14-1 |
| P1 | SALIDA RELE | J14-2 |
| | 12V DC | J15-1 |
| P2 | SALIDA RELE | J15-2 |
| | 12V DC | J16-1 |
| P3 | SALIDA RELE | J16-2 |
| | 12V DC | J17-1 |
| P4 | SALIDA RELE | J17-2 |
| | 12V DC | J18-1 |
| P5 | SALIDA RELE | J18-2 |

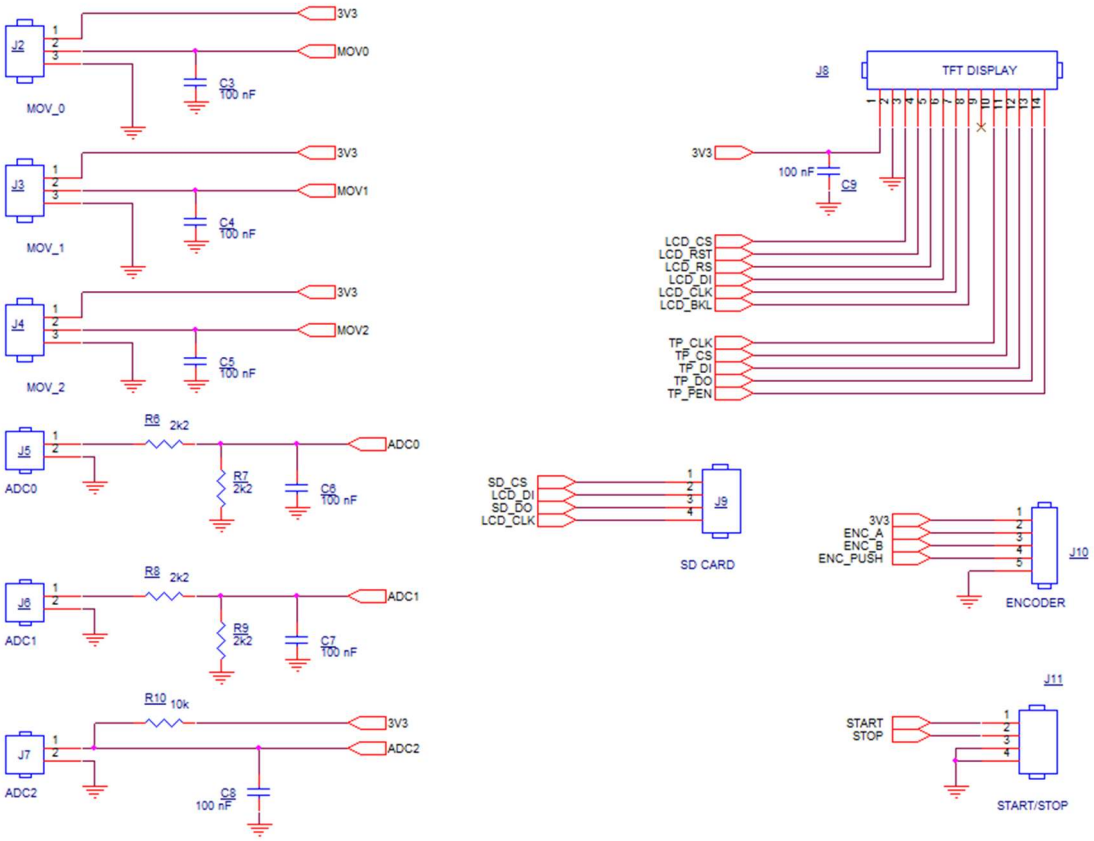



Fig.3. I/O, TFT, Touch and SD Card.

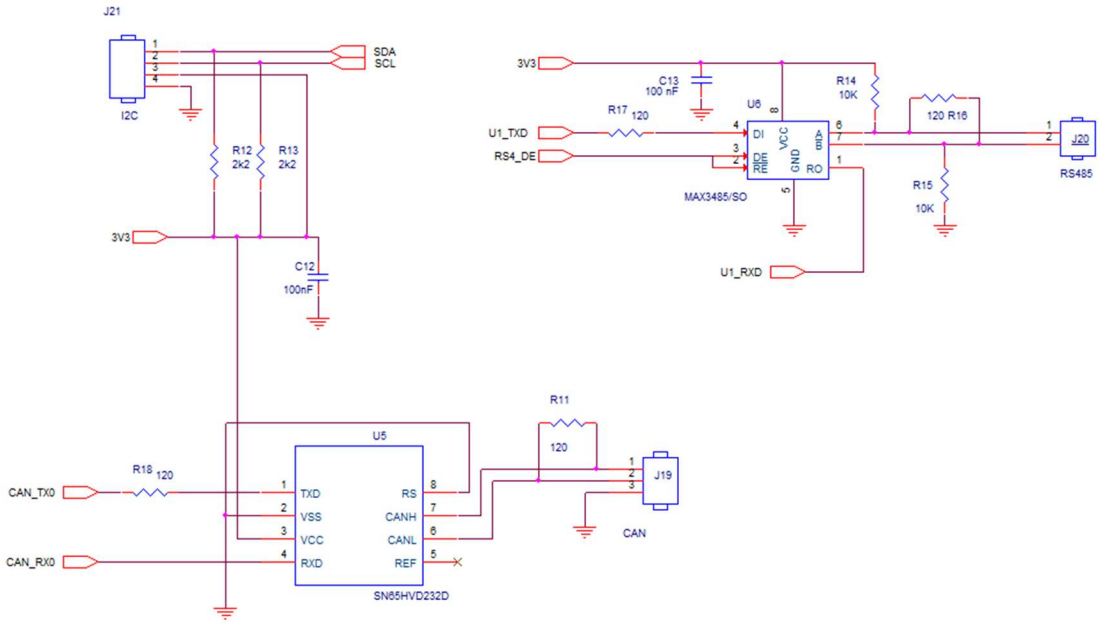
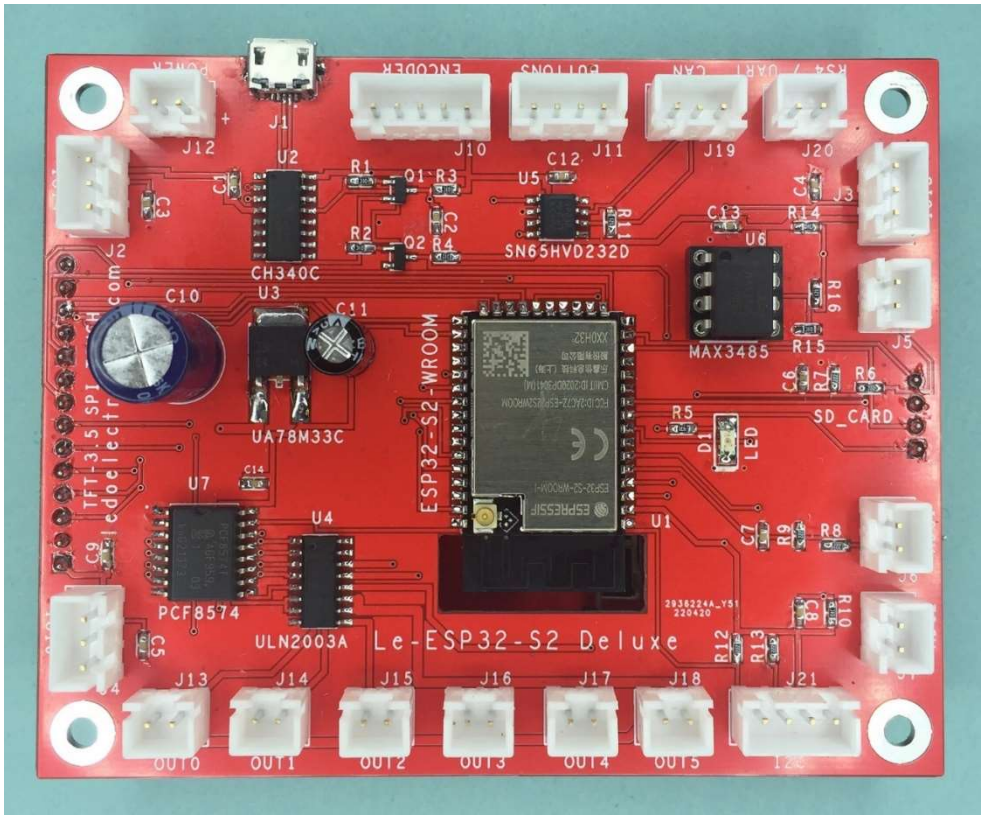
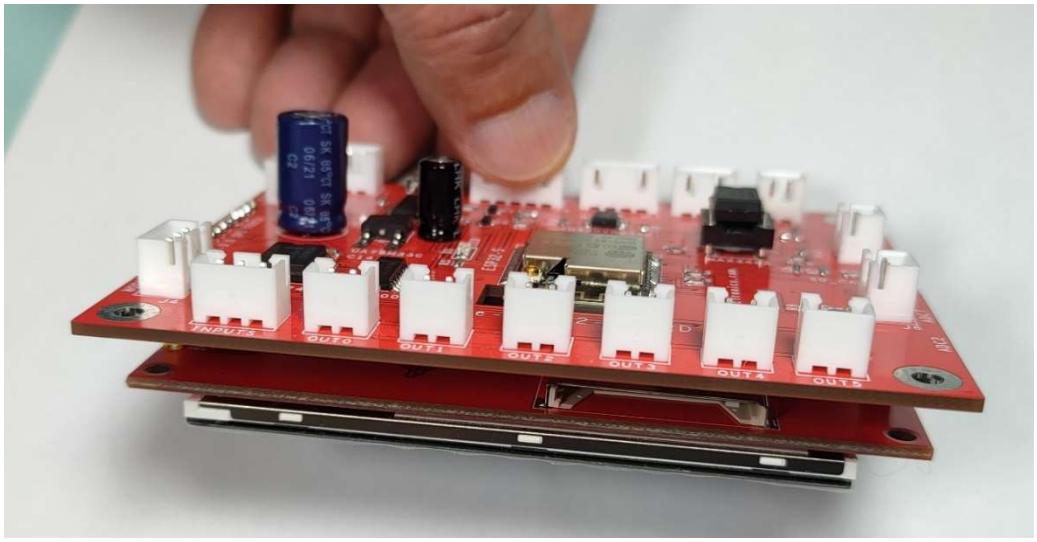



Fig.4. I2C, CAN Bus and RS485.

The conversion chip to RS485 (U6) has been mounted on a socket, so that it can be removed in case you want to use the interface in UART mode. In this case, we need to connect jumpers between pins 4 and 6 and pins 1 and 7 of the DIP8 socket.

The computing power of the 32-bit microcontroller, the presence of analog and digital inputs, outputs, its large number of communication buses, and the color graphic touch screen make this board an attractive option for the design of control systems and various IoT applications.




***Conclusions:***

Unlike the rest of the IoT modules on the market, this one is characterized by being compact and versatile, intended to be used also in real process control equipment, it has everything necessary to adapt to a very diverse range of applications, without need to add other modules.