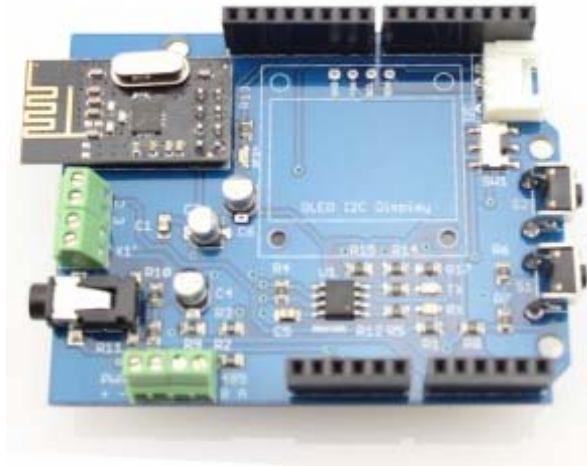# Energy Monitor Shield V2

Energy Monitor Shield v2 is an Arduino-compatible expansion card designed for building energy monitoring system with support I2C OLED display, with the phototransistor to read data from the built-in LED for different energy meters, interface RS485 and built-in wireless transceiver nRF24L01 +.

Feature

- Connection current sensor
- Support for OLED-display I2C
- Terminal for connecting the phototransistor BPW85C
- RS485 interface
- Two buttons to control (enabled one analog pin)
- Transceiver for 2.4G nRF24L01 + soldered on the motherboard
- GROVE -compatible connector: I2C
- Full compatibility with (Wiznet 5100 + SD)

Layout and schematics
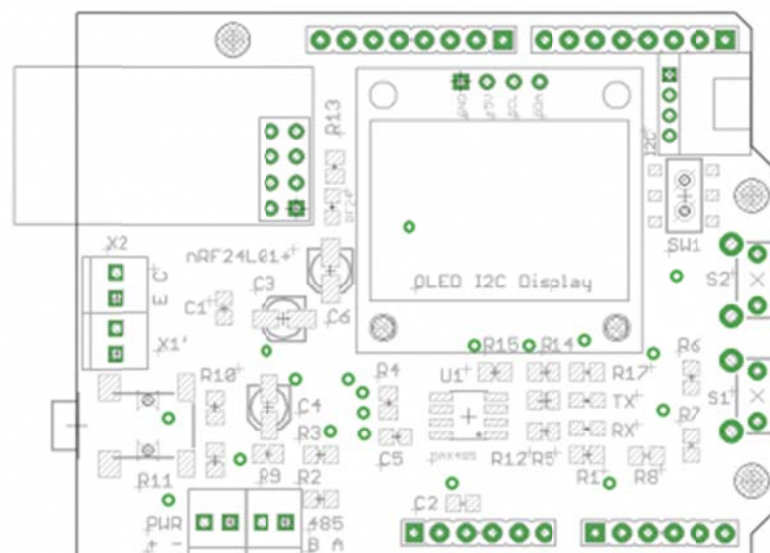
The left side of EM Shield is a connector for current sensors (terminals X1 and X1 '- duplicate each other).

X2 - connector for the phototransistor.

In the upper right corner - I2C-connector.

Just below the right are two buttons (labeled S1 and S2).

Left-bottom-placed terminals for interface RS485 (referred to as PWR and AB).

Below I2C connector is a switch that connects / disconnects Arduino-pins RX / TX on chip MAX485 (switching "programming" and "work with the interface RS485").

Basic functionality

In the basic version (without the use of Ethernet Shield) is possible to organize a non-invasive monitoring of energy consumption using current sensor.

When connecting the phototransistor can be arranged to read data from the meter (LED flashes on the counter).

With the RS485 interface can be carried out to obtain data from the meters (and other devices) equipped with this interface.

Information about the current level of consumption can be displayed on an optional OLED-screen.

Control of the device can be arranged with the help of two buttons on Shield.

The data obtained can be transmitted via nRF24L01 +

Expansion

Additionally EM Shield v2 can be connected to any device using i2c Grove-compatible connections (sensors, displays, etc.).

EM Shield v2 was designed to be fully compatible with [Ethernet Shield (Wiznet 5100 + SD)](#) - so you can use these two together Schild to create even more advanced device monitoring electricity (logging on SD-card and presenting the data on a web page).

Interfaces

- A0 - engaged to connect the sensor AC
- A1 - to connect phototransistor
- A4 (SDA), A5 (SCL) - displayed on connector "I2C" (the other two pins in the connector - VCC and GND for sensor supply)
- Interface for connecting an RF-module nRF24L01 +:
    - D11 - MOSI
    - D12 - MISO
    - D13 - SCK

- o D7 - RF_CE
- o D8 - RF_CSN
- o D2 - RF_IRQ
- Interface for MAX485:
    - o D0 - RX (switched off switch for programming)
    - o D1 - TX (switched off switch for programming)
    - o D5 - Reception / Transmission
- A3 - Buttons

Libraries

Necessary library

To use the EM Shield requires the following libraries:

- Work with the transceiver nRF24L01 + - RF24
- Work with the display OLED (I2C 0.96" OLED 128x64 - Blue&Yellow)- U8glib
- Work with the display OLED (Grove - OLED Display 0.96)- OLED_Display_96X96
- Work with current sensors - EmonLib

Additionally required libraries that are used when working RF24:

- SPI

Features use libraries

Library has used examples that allow easy to understand how they work.

Initialization RF-module as follows:

```
...
```

```
//RF24 radio(CE,CSN);
RF24 radio(7,8);
```

```
...
```

Applications

- Monitoring of electricity consumption
- Get the data from the meters LED flash
- Receive data via RS485 interface
- Data transfer to other devices via nRF24l01 +
- Logging data to SD-card and display on a web page (via Ethernet Shield)