

OpenDTU ESP32S3 MODULE PCB



USER AND SETUP MANUAL

By @sulfuroid

Description of the PCB Board and OpenDTU

OpenDTU is a free, open-source application designed for communication with Hoymiles solar inverters and several others inverters (list at the bottom), offering an alternative to the proprietary DTUs that upload data to the s-Miles cloud.

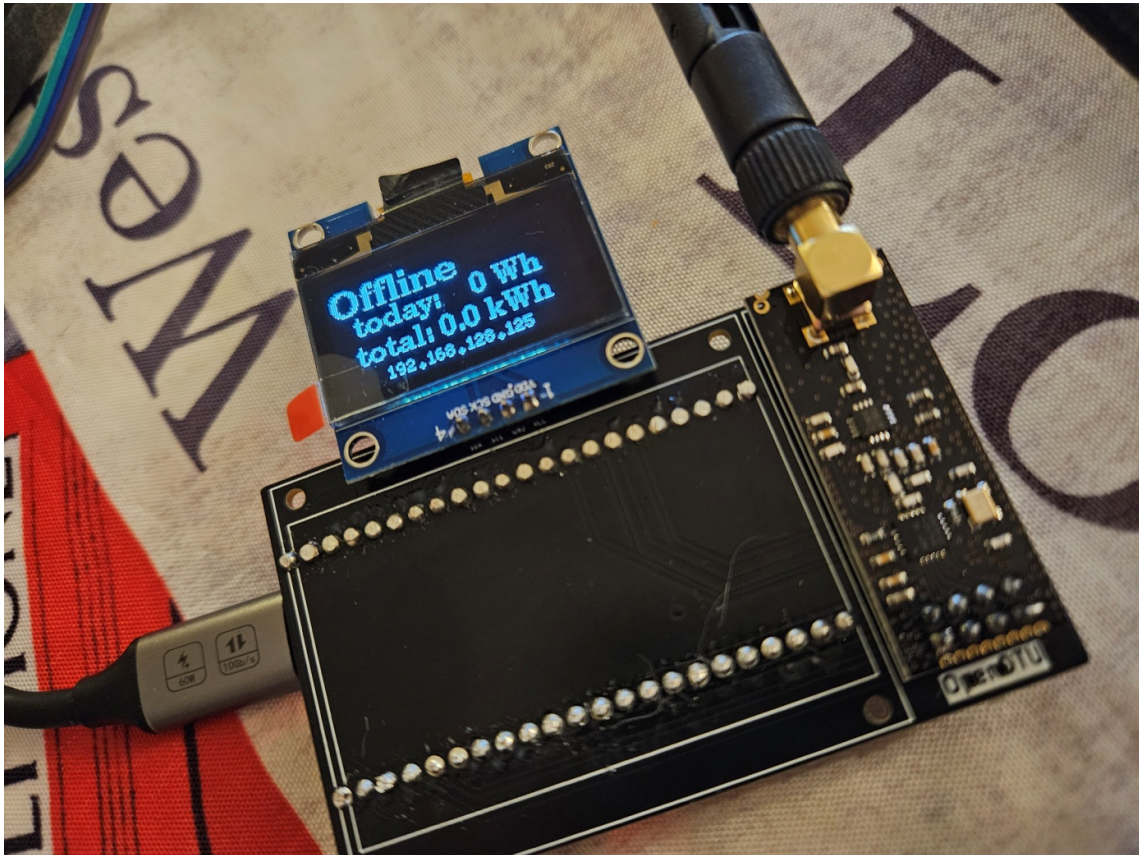
Please be aware that each inverter can only be paired with a single DTU. Attempting to connect an inverter with more than one DTU can cause unexpected behavior.



Key Features:

- Retrieves real-time data directly from the inverter.
- Accesses the inverter's internal event history.
- Displays detailed inverter information, including firmware and hardware versions, firmware release date, and hardware revision.
- Enables viewing and adjusting the inverter's operational limits.
- Allows for inspection and modification of grid profile settings.
- Includes a feature to power the inverter off and on.
- Compatible with up to 10 inverters simultaneously.
- Features MQTT compatibility, including secure TLS connection.
- Supports MQTT Auto Discovery for seamless integration with Home Assistant.
- Offers a user-friendly web application for data visualization.
- Facilitates firmware updates through the web interface.
- Includes time zone adjustment capability.
- Provides Ethernet connectivity.

- Features a Prometheus API endpoint for metrics (</api/prometheus/metrics>).
- Available in English, German, and French for the web interface.
- Supports various display types (SSD1306, SH1106, PCD8544).
- Equipped with status indicator LEDs.
- Allows for easy configuration management, including the ability to export and import settings.
- Features a Dark Theme option for the interface.



Components list and where to get them

Source for the GM12864-59N Display

<https://www.aliexpress.com/item/1005004237282931.html>

Source for the NRF24L01+ Radio chip

<https://fr.aliexpress.com/item/1005004941530728.html>

Source for OpenDTU Software

<https://github.com/tbnobody/OpenDTU>

Source for the ESP32S3 DEV BOARD (S3 N16R8)

<https://fr.aliexpress.com/item/1005006051177409.html>

How to flash the software onto the ESP32S3

Go to <https://espressif.github.io/esptool-js/>



ESP Tool

A Serial Flasher utility for Espressif chips

[View the API Documentation](#)

Program

115200 ▾ [Connect](#)

Console

[Start](#) [Reset](#)

Plug the ESP32S3 dev module to your computer USB. USB-C plug named « COM » on the ESP32 Dev Board.

Program

Connected to device: ESP32-S3

Copy Trace

Disconnect

Erase Flash

Flash Address

File

0x0

Choisir un fichier opendtu-g...factory.bin

Add File

Program

```
esptool.js
Serial port WebSerial VendorID 0x1a86 ProductID 0x55d3
Connecting....
Detecting chip type... ESP32-S3
Chip is ESP32-S3
Features: Wi-Fi,BLE
Crystal is 40MHz
MAC: 34:85:18:46:a3:1c
Uploading stub...
Running stub...
Stub running...
```

Select 115200 Bauds rate communication and click connect and select the good COM port.

Click ERASE FLASH

Select file : opendtu-generic_esp32s3.factory.bin you can find here :

https://www.opendtu.solar/firmware/flash_esp/

Flash Address

File

0x0

Choisir un fichier opendtu-g...factory.bin

Add File

Program

Enter flash address : 0x0 then click PROGRAM to write to the ESP32S3

Program

Connected to device: ESP32-S3

Copy Trace

Disconnect

Erase Flash

Flash Address

File

0x0

Choisir un fichier opendtu-g...factory.bin

Add File

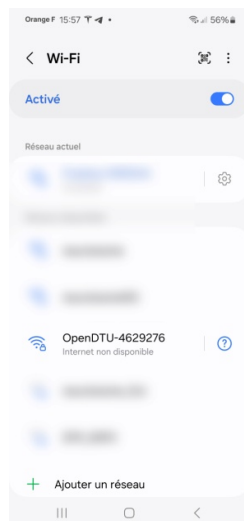
Program

```
esptool.js
Serial port WebSerial VendorID 0x1a86 ProductID 0x55d3
Connecting....
Detecting chip type... ESP32-S3
Chip is ESP32-S3
Features: Wi-Fi,BLE
Crystal is 40MHz
MAC: 34:85:18:46:a3:1c
Uploading stub...
Running stub...
Stub running...
Warning: Image file at 0x0 doesn't look like an image file, so not changing any flash settings.
Compressed 1612640 bytes to 1041348...
Writing at 0x0... (1%)
Writing at 0x12081... (3%)
Writing at 0x16cf5... (4%)
Writing at 0x1ac64... (6%)
Writing at 0x1ef79... (7%)
Writing at 0x22f74... (9%)
Writing at 0x26f6f... (10%)
Writing at 0x2af6a... (12%)
Writing at 0x2ef65... (14%)
Writing at 0x32f60... (15%)
Writing at 0x36f5b... (17%)
Writing at 0x3af56... (18%)
Writing at 0x3ef51... (20%)
Writing at 0x45ee7... (21%)
Writing at 0x500bc... (23%)
Writing at 0x5c139... (25%)
Writing at 0x6cccf... (26%)
```

Once the flash is completed, press RST button on the ESP32S3 Dev Board

Do not forget to DISCONNECT

Open your smartphone or computer and search the SSID OpenDTU-XXXXX

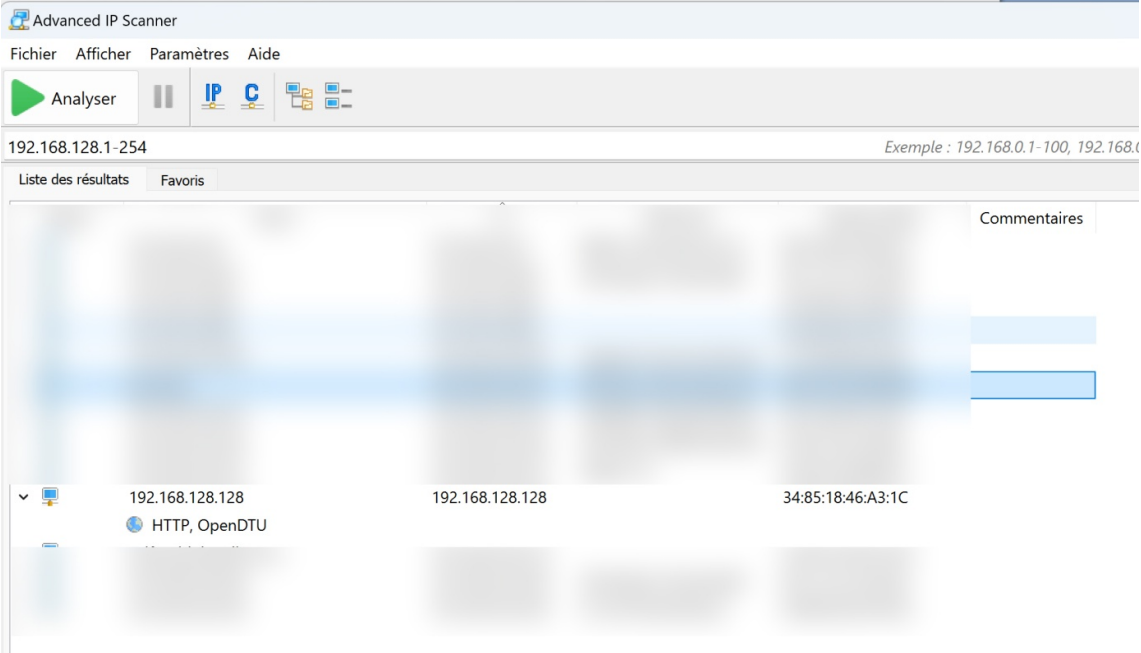


Access Point called "OpenDTU-*" is opened. The default password is openDTU42

Use <http://192.168.4.1> to access the configuration of the device.

Navigate to Settings --> Network Settings and enter your WiFi credentials. The username to access the config menu is "admin" and the password the same as for accessing the Access Point (default: openDTU42) . Once your wifi setting are set , press « SAVE ». More info here : https://www.opendtu.solar/firmware/wifi_setup/

Then use an IP scanner such as : <https://www.advanced-ip-scanner.com/fr/> and find the IP of the MODULE on your wifi network. Open your web browser and go to CONFIG MANAGEMENT (user name : admin , pass : openDTU42) , select pinmapping then select the file « pin_mappingdemo.json » file and click restore.



The screenshot shows the Advanced IP Scanner application. The interface includes a menu bar (Fichier, Afficher, Paramètres, Aide), a toolbar with buttons for 'Analyser', a pause icon, and icons for IP, C, and a folder. The main display area shows a range of IP addresses from 192.168.128.1 to 254. Below this, there are tabs for 'Liste des résultats' and 'Favoris'. A table of results is visible, with columns for IP address, MAC address, and a comment. One device is listed with IP 192.168.128.128, MAC 34:85:18:46:A3:1C, and comment 'HTTP, OpenDTU'. At the bottom, there is a navigation bar for 'OpenDTU' with links for 'Live View', 'Settings', 'Info', and 'About'.

IP	MAC	Comment
192.168.128.128	34:85:18:46:A3:1C	HTTP, OpenDTU

Config Management

Backup: Configuration File Backup

Backup the configuration file

config.json

Backup

Restore: Restore the Configuration File

Main Config (config.json)

Choisir un fichier

Aucun fichier choisi

Restore

Note: This operation replaces the configuration file with the restored configuration and restarts OpenDTU to apply all settings.

Initialize: Perform Factory Reset

Restore Factory-Default Settings

Restore: Restore the Configuration File

Main Config (config.json) ▾

Choisir un fichier

Aucun fichier choisi

Restore

Main Config (config.json)

Pin Mapping (pin_mapping.json)

Note: This operation replaces the configuration file with the restored configuration and restarts OpenDTU to apply all settings.

Restore: Restore the Configuration File

Pin Mapping (pin_mapping.json) ▾

Choisir un fichier

pin_mappingdemo.json

Restore

Note: This operation replaces the configuration file with the restored configuration and restarts OpenDTU to apply all settings.

Go to settings > Device Manager to check if the config is ok.

Device-Manager

Connection settings

Display

LEDs

Selected profile:

Your device may stop responding if you select an incompatible profile. In this case, you must perform a deletion via the serial interface.

Connection overview

Category	Name	Selected	Active
Cmt	clk		-1
	cs		-1
	fcs		-1
	gpio2		-1
	gpio3		-1
	sdio		-1
Display	clk		255
	cs		255
	data		255
	reset		255
	type		0

You need to select the new pinmapping and save it to get sure the new config is activated. See below.

Device-Manager

Connection settings **Display** LEDs

Selected profile: NRF24 GM12864-59N
(Default settings)
NRF24 GM12864-59N

Your device may stop responding if you select an incompatible profile. In this case, you must perform a deletion via the serial interface.

Connection overview

Category	Name	Selected	Active
Cmt	clk		-1
	cs		-1
	fcs		-1
	gpio2		-1

Go to display and set contrast to 100% (some displays show nothing if contrast is lower).

Live View Settings Info About

Device-Manager

Connection settings **Display** LEDs

Enable Power Save: ☒

Enable Screensaver: ☒

Diagram mode: Small

Diagram duration: 36000 Seconds

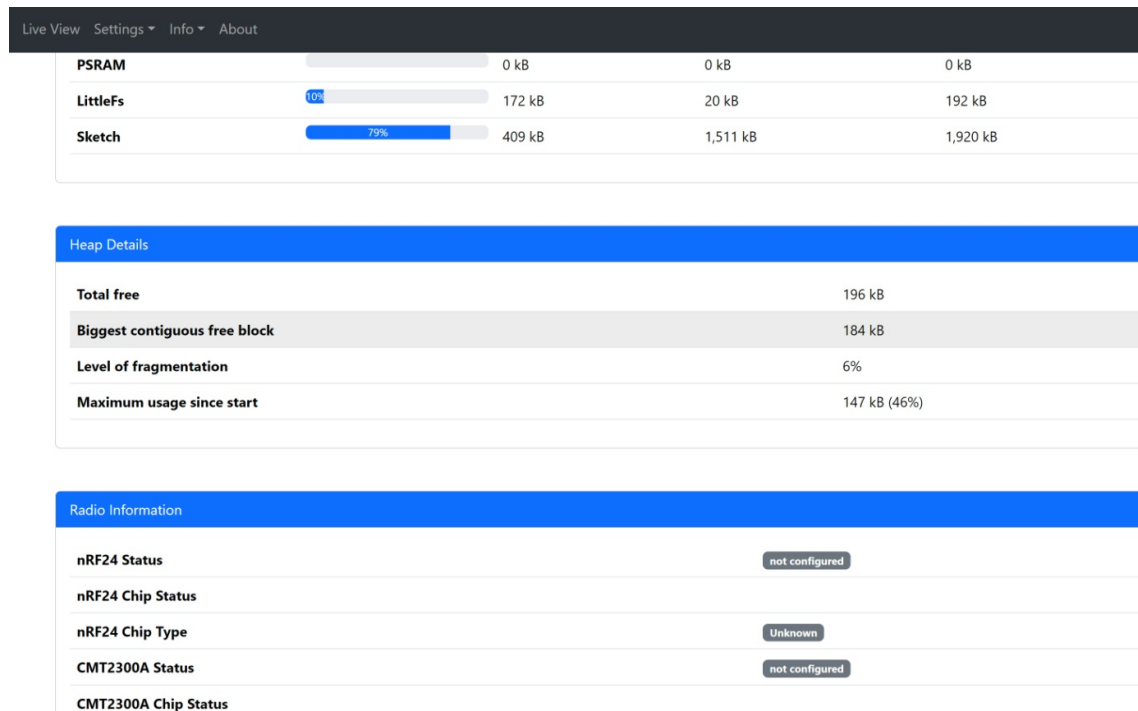
Display language: English

Rotation: 180 degree rotation

Contrast (100%):

Cancel Save

You can now go to INFO > INFO SYSTEM to check if the RADIO IS ON. NRF24 should be green.



You can now follow the instruction of https://www.opendtu.solar/firmware/configuration/inverter_settings/ to add inverters to the config.

Known Compatible inverters

- Hoymiles HM-300-1T
- Hoymiles HM-350-1T
- Hoymiles HM-400-1T
- Hoymiles HM-600-2T
- Hoymiles HM-700-2T
- Hoymiles HM-800-2T
- Hoymiles HM-1000-4T
- Hoymiles HM-1200-4T
- Hoymiles HM-1500-4T
- Solenso SOL-H350
- Solenso SOL-H400
- Solenso SOL-H800
- TSUN TSOL-M350
- TSUN TSOL-M800
- TSUN TSOL-M1600