



BL-M8812EU2

5 GHz Wi-Fi module with the Realtek RTL8812EU chip
for OpenIPC / WFB-ng digital video transmission



**Never start transmitting without the antennas and heat sink connected.
Set the transmit power according to the regulations of the country of
operation.**

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1. Safety instructions

1.1 Before you start

The BL-M8812EU2 is a stand-alone radio module without a housing, intended to be built into your own digital video transmission system. Installing it requires soldering, working with a power supply and basic knowledge of Linux. Read this manual completely before connecting the module for the first time and keep it for future reference.

- The product may only be used by persons over 14 years of age.
- The module is a high-power transmitter. You may only transmit in the frequency bands and with the power permitted by the regulations of the country in which you operate it – see chapter 3.
- Do not tamper with the module, do not remove the shielding can and do not modify the board. Damage caused by improper intervention is not a defect of the product.

1.2 Power supply and wiring

- Power the module only with a DC voltage of **5.0 V ±0.25 V** (4.75–5.25 V). A higher voltage will permanently damage the module, a lower voltage causes link dropouts.
- The power supply must deliver a peak current of at least **1800 mA** with a ripple below 200 mV. Do not power the module from a computer USB port or from the 5 V output of the flight controller (FC).
- Observe the correct polarity of the power supply. Before switching the power on, check the wiring and make sure there is no short circuit between the pins.
- The RESET input works with a 3.3 V level. The voltage on it must not exceed 3.6 V – never apply 5 V to it.
- Always do the wiring with the power disconnected.

1.3 Heat and cooling

- The power amplifiers of the module generate a large amount of heat. The manufacturer specifies that **a heat sink must be added** to the module. Never switch the module on without a heat sink.
- The module and the heat sink get very hot during operation. Do not touch them during operation or shortly afterwards – risk of burns.
- Do not place the module near flammable materials and do not cover it with insulation, foam or heat-shrink tubing.

1.4 Antennas and radio-frequency radiation

Never start transmitting without the antennas connected. The module has no protection against operation without an antenna and the power amplifiers can be permanently damaged.

- During operation always connect **both** antennas (J0 and J1).
- Do not touch the antennas while transmitting and keep them at a distance from your body. Do not place the antennas near the eyes or head.
- Do not use the module where the use of radio equipment is prohibited (aircraft, hospitals, areas with a risk of explosion) or near medical devices such as pacemakers.

1.5 Static electricity and operating environment

- The module is sensitive to electrostatic discharge. Work on an antistatic mat, use a grounding wrist strap and hold the module by the edges of the board.
- Protect the module from water, moisture, dust and condensation. The ambient operating temperature is $-20\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$, relative humidity 10–95 % without condensation.
- Do not continue to use a module that is mechanically damaged, overheated or has been exposed to moisture.

2. Product description

2.1 What the module is for

The BL-M8812EU2 is a 5 GHz Wi-Fi transmit and receive module with the **Realtek RTL8812EU** chip. It connects to the host device – an IP camera or a single-board computer – via a USB 2.0 interface. Each of the two antenna paths has its own power amplifier (FEM); the module works in a 2T2R configuration (two antennas for both transmitting and receiving) and also supports a narrow 10 MHz channel.

In the **OpenIPC** and **WFB-ng** digital video transmission systems, the module forms the radio part: on the model it works as a video transmitter (VTX), on the ground as a receiver. Video transmission over Wi-Fi has a higher latency than analogue or dedicated digital systems, so it is suitable mainly for FPV wings and GPS-stabilised drones, not for freestyle and racing drones.

2.2 Package contents

- 1× Wi-Fi module BL-M8812EU2

Antennas, heat sink, thermal pad and connecting cable **are not included**.

2.3 Parts description



Top view

- ① Antenna connector J0 (IPEX MHF-1) – antenna path ANT0
- ② Antenna connector J1 (IPEX MHF-1) – antenna path ANT1
- ③ Shielding can with the RTL8812EU chip and power amplifiers
- ④ FPC connector J3 (11 pins, 0.5 mm pitch) – USB, power and RESET
- ⑤ Solder pads along the edge of the board (pins 1-18)

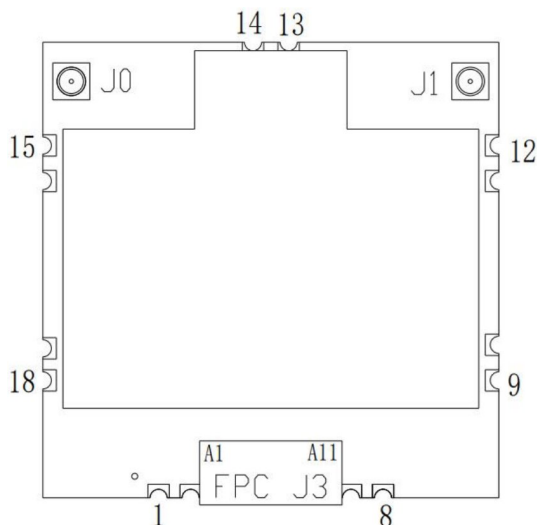
2.4 Specifications

Parameter	Value
Manufacturer	SHENZHEN BILIAN ELECTRONIC CO., LTD. (LB-LINK), 10-11/F, Building 1A, Huaqiang idea park, Guangming district, Shenzhen, Guangdong, China, www.b-link.net.cn
Type	BL-M8812EU2
Chipset	Realtek RTL8812EU-CG
Standards	IEEE 802.11a/n/ac
Frequency bands	5150-5250 MHz, 5250-5350 MHz, 5470-5725 MHz, 5725-5850 MHz
Channels (20 MHz width)	36-48, 52-64, 100-140, 149-165
Antenna configuration	2T2R
Channel width	10 / 20 / 40 / 80 MHz
Max. data rate	867 Mb/s (802.11ac, 80 MHz, 2T2R)
Max. recommended transmit power	29 dBm $\pm$ 2 dB (802.11a, 6 Mb/s), at each antenna output
Receiver sensitivity	-96 dBm (802.11a, 6 Mb/s)
Interface	USB 2.0 – solder pads or FPC connector
Antenna connectors	2× IPEX MHF-1 (u.FL)
VSWR of connected antenna	typ. 1.5, max. 2
Power supply	5.0 V $\pm$ 0.25 V, ripple < 200 mV
Current consumption	max. 1800 mA
Ambient operating temperature	-20 °C to +70 °C (with heat sink)
Operating humidity	10-95 % RH, non-condensing
ESD resistance	2 kV (HBM)
Dimensions	32.0 × 32.0 × 3.4 mm

※ Further transmit power values according to the manufacturer: 28 dBm for 802.11n MCS0 (20 and 40 MHz), 27 dBm for 802.11ac MCS0 (80 MHz); the power is lower at higher modulations. The values apply at the antenna connector, without antenna gain.

2.5 Pin assignment

The USB, power and RESET signals are brought out in parallel to solder pads 1–8 and to the FPC connector J3. Pins with the same name are connected inside the module – always use only one connection method.



Pin layout – top view (according to the manufacturer's drawing)

Pad	FPC J3	Signal	Description
1, 4	A1, A2, A5, A6	GND	ground
2	A3	USB D+	USB 2.0, positive line of the differential pair
3	A4	USB D–	USB 2.0, negative line of the differential pair
5	A11	RESET	3.3 V input, active low – shutdown and reset of the module
6, 7	A7–A10	VDD 5.0 V	5.0 V power supply
8–18	–	GND	ground
J0	–	ANT0	antenna connector of path ANT0
J1	–	ANT1	antenna connector of path ANT1

- Inside the module, the RESET input is connected through a resistor to the internal 3.3 V supply. Pulling it low shuts down or resets the module.
- According to the OpenIPC documentation, ground pads 9–18 can be left unconnected.

3. Legal conditions of operation

3.1 The law of the country of operation applies

European Union regulations on radio equipment and unmanned aircraft apply in all member states, but the permitted frequency bands, maximum transmit powers and operating conditions are set by each country individually. The information in this chapter describes the situation in the Czech Republic. If you operate the module in another country, you must follow the regulations of the country in which you operate it.

3.2 Module power and legal limits

The module is technically capable of transmitting with a power and on frequencies that are not permitted in the Czech Republic or in other EU countries. You must always set the frequency and power yourself so that they comply with the regulations of the country of operation. The operator is responsible for compliance with the regulations and for any interference.

- Legal limits are stated as **e.i.r.p.** – equivalent isotropically radiated power. It is the power at the module output increased by the antenna gain and, with two transmitting antennas, the sum of both antenna paths.
- The manufacturer states a recommended transmit power of up to **29 dBm (approx. 800 mW) at each antenna output**. This exceeds the limits given in chapter 3.3 many times over.
- Example: a limit of 25 mW e.i.r.p. corresponds to 14 dBm. With an antenna gain of 2 dBi, the sum of the power of both antenna outputs may be at most 12 dBm (approx. 16 mW).
- The values set in the driver do not correspond to the actual power in dBm (chapter 5.3). The actual radiated power can only be verified by measurement.
- It is prohibited to connect additional amplifiers to the module or to modify it so that it exceeds the permitted parameters.

3.3 5 GHz frequency bands in the Czech Republic

The conditions are set by the general authorisations of the Czech Telecommunication Office VO-R/12 (wideband data transmission systems) and VO-R/10 (short-range devices). Status as of October 2026:

Band	Max. e.i.r.p.	Conditions	On a drone
5150–5250 MHz	200 mW	10 mW/MHz; indoors, outdoors only under the conditions of VO-R/12; unmanned aircraft only in the 5170–5250 MHz section	yes, 5170–5250
5250–5350 MHz	200 mW	10 mW/MHz; indoors only; DFS and TPC mandatory	no
5470–5725 MHz	1 W	50 mW/MHz; DFS and TPC mandatory; according to EU Decision 2022/179 not permitted on unmanned aircraft	no
5725–5850 MHz	1 W	only fixed outdoor stations notified to the Czech Telecommunication Office, protection zones	no
5725–5875 MHz	25 mW	short-range devices (VO-R/10)	yes

- DFS (dynamic frequency selection) and TPC (transmit power control) are functions that must be provided by the device software. If the transmitter firmware does not provide them, do not transmit in the bands where they are mandatory.
- The current wording of the general authorisations is available at ctu.gov.cz/vseobecna-opravneni.

3.4 Use on unmanned aircraft

The module itself is not an unmanned aircraft. The operation of a drone or aircraft in which the module is installed is governed by Regulation (EU) 2019/947 and the rules of the Czech Civil Aviation Authority (dron.caa.cz).

- During flight you must maintain direct visual contact with the unmanned aircraft. When flying with FPV goggles, an observer who watches the aircraft must stand next to the pilot.
- On a drone in the Czech Republic you may only transmit in the 5170–5250 MHz section (max. 200 mW e.i.r.p.) or 5725–5875 MHz (max. 25 mW e.i.r.p.) – see chapter 3.3.

4. Installation

4.1 What else you need

- two 5 GHz antennas with an IPEX MHF-1 (u.FL) connector, or with an adapter to another connector,
- a heat sink with a thermal pad – see chapter 4.2; for higher power a heat sink with a fan,
- a regulated 5 V power supply – see chapter 4.4,
- a host device with a USB 2.0 interface and the Linux operating system (IP camera or single-board computer) with OpenIPC or WFB-ng firmware,
- a fine-tip soldering iron, thin wires, or an FPC flat cable (11 conductors, 0.5 mm pitch).

4.2 Mounting the heat sink

The manufacturer requires additional cooling. Without it, the module overheats and cannot operate over the whole operating temperature range.

- Place the heat sink on the **underside of the module** – on the area with the gold-plated ground pads. The heat sink should measure at least **32 × 32 mm**.
- Insert a thermal pad with a thermal conductivity of approx. **4 W/m·K** and a thickness of up to **1.5 mm** between the heat sink and the module.
- The heat sink must not touch the solder pads or wires along the edge of the module – risk of short circuit.
- At higher power settings, use a heat sink with a fan and ensure airflow inside the model too.
- The chip temperature must not exceed 125 °C.

4.3 Connecting the antennas

- Always connect the antennas **before switching on** the power for the first time. Use both antennas (J0 and J1).
- Place the IPEX connector perpendicularly over its counterpart and press it straight down until it clicks into place. When disconnecting, lift it straight up, preferably with a tool intended for IPEX connectors; do not pull on the cable.
- Secure the antenna cables against being pulled out so that vibration or cable movement does not pull on the connector.
- Route the antennas away from carbon parts, metal parts and high-current wires, and orient them so that the body of the model does not shadow them in flight.

4.4 Connecting power and USB

- ① Connect **GND** and **VDD 5.0 V** (pads 6 and 7 or pins A7–A10) to the 5 V power supply. The OpenIPC documentation recommends a power supply rated for **more than 3 A** – at high power settings the module's current draw can exceed 2 A.
 - ② Connect **USB D+** and **USB D–** to the USB port of the host device. Route the wires as a twisted pair and keep them as short as possible.
 - ③ Connect the ground of the module to the ground of the host device – a common ground is required.
 - ④ You can connect the RESET input to a control output of the host (3.3 V); if it is not needed, leave it unconnected.
- Use power wires of sufficient cross-section and keep them short. The voltage drop during transmission must not reduce the voltage at the module below 4.75 V.
 - The manufacturer recommends powering the module from a current-mode DC/DC converter that responds quickly to changes in load.

4.5 Soldering

The module is not suitable for reflow soldering. The high temperature damages the thermal pad between the chip and the shielding can.

- Solder the wires by hand, using a temperature-controlled fine-tip soldering iron, and solder quickly so as not to overheat the pads unnecessarily.
- After soldering, check that there is no solder bridge between adjacent pads.

5. Getting started

5.1 Driver and firmware

For video transmission, the module is used in *monitor mode* with packet injection. This requires a modified Linux driver for the RTL8812EU chip (rtl88x2eu / rtl8812eu), referenced by the OpenIPC and WFB-ng projects.

- For some IP camera processors, the driver is already included in the OpenIPC firmware by default. Otherwise the firmware must be built from source with the driver enabled.
- Installation and configuration instructions can be found in the project documentation: docs.openipc.org and github.com/svpcom/wfb-ng.
- The ground station and the model must be set to the same channel and the same channel width.

5.2 Channel width

The manufacturer states channel widths of 10, 20, 40 and 80 MHz. However, according to the OpenIPC documentation, the driver currently supports only **5, 10 and 20 MHz** for FPV transmission; 40 MHz works for reception only.

- The recommended width for transmission is 10 or 20 MHz. A narrower channel increases the range, a wider one allows a higher data rate.
- The driver author does not recommend 5 MHz for transmission (interference into adjacent frequencies).
- If you receive no image after switching to 40 MHz, follow the article *How to fix glitch on EU and BU-based VTXes* in the OpenIPC documentation (transmitter firmware update).

5.3 Setting the transmit power

The transmit power is set in software, using the `driver_txpower_override` parameter in the `/etc/wfb.conf` file (range 0–63) or the `iw dev wlan0 set txpower fixed` command (range 0–3150).

- The value you set **does not correspond to the actual power in dBm**. The actual radiated power can only be verified by measurement.
- At high values the power amplifier goes into saturation: the power hardly increases any more, but the current draw and temperature rise sharply and the signal quality deteriorates. The OpenIPC documentation therefore recommends a `driver_txpower_override` value of 40–50 for this module.
- The driver shows an approximate chip temperature in the `thermal_state` file in the `/proc/net/rtl88x2eu/` folder. The value is not accurate; it is only intended to estimate whether the module is overheating.
- The user is responsible for setting the power within the limits of the regulations – see chapter 3.2.

6. Operation, maintenance and storage

6.1 Before each use

- Check that both antennas are connected and undamaged and that the IPEX connectors hold firmly.
- Check the mounting of the heat sink and that the fan works.
- Check the power wires and soldered joints.
- Make sure that a permitted channel and power are set in accordance with chapter 3.

6.2 Maintenance

- Keep the module clean; remove dust with a dry soft brush or compressed air.
- Do not use solvents or water.
- After a crash of the model, check the module, connectors and antennas before transmitting again.

6.3 Storage

- Store the module in an antistatic bag, in a dry place, at a temperature of 5 °C to 40 °C and a relative humidity of 20–90 %.
- Limit storage conditions according to the manufacturer: –40 °C to +85 °C, 10–95 % RH non-condensing.
- Protect the module from direct sunlight and mechanical damage.

7. Troubleshooting

Problem	Possible cause and solution
The host does not detect the module	Check the 5 V power supply, the USB D+ / D– wiring (are the lines swapped?) and the common ground. Make sure the driver for the RTL8812EU is loaded in the system.
The module disconnects or restarts while transmitting	The power supply cannot handle the peak current or the power wires are too thin or too long. Use a more powerful supply and shorter wires, or reduce the transmit power.
No image after switching to 40 MHz	Transmission at 40 MHz width is not supported. Set the width back to 10 or 20 MHz; for the recovery procedure see chapter 5.2.
Short range, video dropouts	Check the antennas and connectors, the position of the antennas in the model and that the channel and channel width match on both sides. Choose a channel with less interference.
The link gets worse the longer the module runs	The module is overheating. Improve the cooling (larger heat sink, fan, airflow) or reduce the transmit power.
Increasing the power did not increase the range	The amplifier is saturated. Set the power back to a lower value – see chapter 5.3.

8. Information for the EU and Czech Market

8.1 Importer and responsible person in the EU

The product is placed on the European Union market by the importer stated below, who is at the same time the responsible person within the meaning of Article 16 of Regulation (EU) 2023/988 of the European Parliament and of the Council on general product safety (GPSR).

Importer / responsible person in the EU	Rotorama, s.r.o.
Company ID (IČO)	051 57 692
VAT ID (DIČ)	CZ05157692
Registered office	Okrajová 1351, 674 01 Třebíč, Czech Republic
E-mail	info@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.com

8.2 Product conformity



- The product bears the **CE** marking and complies with the requirements of the applicable European Union harmonisation legislation.
- A copy of the **EU Declaration of Conformity** is available from the importer at the address stated above or at the e-mail address info@rotorاما.cz.
- **Product identification:** the type designation (BL-M8812EU2) is given on the shielding can of the module and on the underside of the board.

8.3 Disposal of electrical equipment



- The crossed-out wheeled bin symbol on the product, its packaging or in the documentation means that at the end of its service life the product **must not be disposed of together with mixed municipal waste**.
- Hand it over at a take-back point for electrical equipment – at a collection yard, at a take-back point of a collective system, or at the retailer when purchasing a new equivalent product. Take-back is free of charge for the end user.
- The obligations under Act No. 542/2020 Coll., on end-of-life products, are fulfilled by the importer through a collective take-back system.
- Proper disposal helps prevent negative impacts on the environment and human health and contributes to the reuse of secondary raw materials.

Through its contractual partner **ASEKOL a.s.**, the company ensures the take-back of waste electrical equipment from households and the separate collection of waste electrical equipment, batteries and accumulators in accordance with the applicable legislation. The customer is entitled to hand over old electrical equipment or a battery or accumulator at any collection point of the above contractual partner. The addresses of these take-back points are listed at www.asekol.cz, www.ecobat.cz and also <https://visoh2.mzp.cz/RegistrMistZO/RegistrMistZOPublic/MapaMistZpetOdberu>.

9. Warranty and rights arising from defective performance

The rights and obligations of the contracting parties are governed by Czech law, in particular by Act No. 89/2012 Coll., the Civil Code, and Act No. 634/1992 Coll., on consumer protection.

- The seller is liable to the buyer for the product being free of defects on receipt. If the buyer is a consumer, a defect may be notified **within two years of receipt** of the product (Section 2165 of the Civil Code).
- If a defect appears within **one year** of receipt, the product is deemed to have been defective already at the time of receipt (Section 2161(5) of the Civil Code).
- When purchasing online, a consumer has the right to **withdraw from the contract within 14 days** of receiving the goods without giving a reason (Section 1829 of the Civil Code).
- Claims should be made with the retailer from whom you purchased the product. The importer's contact details are given in Chapter 8.1.
- The competent body for out-of-court settlement of consumer disputes is the **Czech Trade Inspection Authority**, Štěpánská 796/44, 110 00 Prague 1, www.coi.cz.