

Model No.EP01

The EP01 is a powerful, versatile Wi-Fi+Bluetooth LE MCU module that targets a wide range of applications, from low-power sensor networks to the most demanding tasks. At the core of this module is the ESP32-D0WDQ6* chip. The integrated chip is designed to scale and adapt. There are two CPU cores that can be controlled individually, and the CPU clock frequency is adjustable from 80 MHz to 240 MHz. The chip also has a low-power coprocessor that can be used in place of the CPU to save power when performing tasks that do not require much processing power, such as monitoring peripherals. The ESP32 integrates a rich set of peripherals. The integration of Bluetooth LE and Wi-Fi ensures that a wide range of applications can be targeted, and that the module is versatile: using Wi-Fi provides a large physical range and a direct connection to the Internet via a Wi-Fi router, while using Bluetooth allows the user to conveniently connect to the phone or broadcast low-power beacons for its discovery. The sleep current of the ESP32 chip is less than 5 μ A, making it suitable for battery-powered applications and wearable electronic devices. The module supports data rates up to 150 Mbps. Thus, the module offers industry-leading characteristics and best performance for electronic integration, range, power consumption and connectivity.

Categories	Items	Specifications
2.4GWIFI	Protocols	802.11 b/g/n (802.11n up to 150Mbps)
		A-MPDU and A-MSDU aggregation and 0.4 μ s guard interval support
	Center frequency range of operating channel	2412~2462MHz
Bluetooth	Protocols	Bluetooth LE specification
Hardware	integrated crystal	40 MHz crystal
	Integrated SPI flash	16MB
	Operating voltage/Power supply	3.0V~3.6V
	Operating current	Average: 80 mA
	Minimum current delivered by power supply	500mA
	Recommended operating ambient temperature range	-40°C~+85°C
	Package size	16mm x 23 mm x 31mm

- Standard antenna specifications: Model EP01, antenna gain: -0.58 dBi,
- antenna type: PCB antenna
- Usage restriction: Antenna replacement is prohibited
- Non-compliance warning: Unauthorized replacement or modification of the antenna will invalidate the FCC certification and render the product non-compliant for market sale.
- FCC label information:
- FCC ID: 2AIYW-EP01
- Model No.: EP01

Manufacturer: MOKO TECHNOLOGY LTD.

Address: 4F, Building 2, Guanghui Technology Park, Mingqing Rd, Longhua, Shenzhen, China

FCC Warning

2.1 Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209& 15.205

2.3 Specific operational use conditions

This transmitter/module and its antenna(s) must not be co-located or operating in conjunction with any transmitter. This information also extends to the host manufacturer's instruction manual.

2.4 Limited module procedures

Applicable. The product does not have a shielding cover. This module is for restricted use and meets the requirements of FCC Part 15.212.

Sales method: Selling modules separately in the form of materials.

Module installation precautions: The module installation adopts SMT (Surface Mount Technology) technology, which is welded on the surface of the product.

2.5 Trace antenna designs

If trace antenna designs are applicable, full-detail design specifications are required per D02 Module Q&A Question 11.

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.4.

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification;
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: The module with PCB antenna designs, The antenna gain is -0.58dBi, and the impedance is 50Ohm.

2.6 RF exposure considerations

The device can be used in portable exposure condition without restriction and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the holder of certificate will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.7 Antennas

For Part 15 and licensed CMRS Client devices a list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Licensed (non-client station) Modules for a base, fixed station can be stated as conducted, and antenna data is not required when it is clear that the licensee is responsible for the applicable limits under the rules and or license.

Explanation: The EUT has PCB antenna. See antenna report for antenna details.

The antenna Max Gain is -0.58dBi and the Impedance is 50Ohm.

2.8 Label and compliance information

FCC ID: 2AIYW-EP01 label. Since the prototype is too small and lacks a shielding cover, the label was included within the user manual.

2.9 Information on test modes and additional testing requirements

The working voltage range of the module is: DC 3.0V~3.6V

If the module experiences overvoltage or undervoltage, or if the temperature is too low or too high, it will stop working, There is no risk of interference.

Radio Technology : Bluetooth V5.0 LE

Operation frequency : 2402-2480MHz

Channel No. : 40 channels

Channel Separation : 2MHz

Data rate: 1Mbps/2Mbps

Modulation : GFSK

Antenna Type : PCB antenna, Maximum Gain is -0.58dBi.

The test mode can be the worst mode in the original report: GFSK 1Mbps 2402MHz.

Note: The maximum power of the module is $0 \pm 1\text{dBm}$. The product uses a fixed onboard antenna and does not involve antenna replacement.

Radio technology : 2.4G WiFi

Operation frequency : 2412MHz-2462MHz for IEEE 802.11 b, g, n/HT20

2422MHz-2452MHz for IEEE 802.11 n/HT40

Channel No. : 802.11b/802.11g/802.11n(HT20): 11CH, 802.11(HT40): 7CH

Modulation type : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)

IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)

IEEE 802.11n:OFDM(64QAM, 16QAM, QPSK, BPSK)

Antenna Type :PCB antenna, Maximum Gain is -0.58dBi.

The test mode can be the worst mode in the original report: B 2412MHz.

Note: The maximum power of the module is $15 \pm 1\text{dBm}$. The product uses a fixed onboard antenna and does not involve antenna replacement.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

2.11 Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

2.12 How to make changes

Since only Grantees are permitted to make permissive changes, it is recommended that module manufactures provide contact information and some guidance to host providers in the integration instructions if they expect their module will be used differently than granted.

Module manufacturer contact: MOKO TECHNOLOGY LTD.

Tel: +86-75523573370

E-mail: devin@mokotechnology.com

FCC Statements

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§15.107 and if applicable §15.109) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module's intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in §15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The Integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module integrated into the host device.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- -Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- -Consult the dealer or an experienced radio/TV technician for help

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- 1) this device may not cause harmful interference, and
- 2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Class II Permissive Change (C2PC) Test Plan for Host Devices

Test plan for Class II Permissive Changes (C2PC) on FCC ID: 2AIYW-EP01.

For BLE(2402-2480MHz):

AC Conducted Emission. (FCC Part 15.207)

Radiated Emission (FCC Part 15.205&209, FCC Part 15.247(d))

Host cannot change the RF Exposure use conditions. If use conditions is changed the separate approval shall be required.

Note:

These tests be based on C63.10 and FCC Part 15.247 as guidance, according to the operating frequency High, mid and low channel test.

For these tests, all modes (GFSK)need to be tested.

For 2.4GWIFI(2412-2462MHz):

AC Conducted Emission. (FCC Part 15.207)

Radiated Emission (FCC Part 15.205&209, FCC Part 15.247(d))

Host cannot change the RF Exposure use conditions. If use conditions is changed the separate approval shall be required.

Note:

These tests be based on C63.10 and FCC Part 15.247 as guidance, according to the operating frequency High, mid and low channel test.

For these tests, all modes (802.11b,802.11g,802.11HT20,802.11HT40)need to be tested.

The above is the test plan for each band.

This module does not contain a shield and therefore is limited, requiring the Grantee to file a Class II permissive change for each specific host per the test plan defined in the module integration instructions.