

EFESP32UE

technical specification

1 Module overview

1.1 Features

CPU and scratchpad memory

- 448 KB ROM
- 520 KB SRAM
- 16 KB RTC SRAM

WiFi

- 802.11b/g/n
- Data rate up to 150 Mbps in 802.11n mode
- Supports A-MPDU and A-MSDU aggregation
- 0.4μs protection interval
- Working channel center frequency range: 2412 ~ 2484 MHz

Bluetooth

- Bluetooth V4.2BR /EDR and Bluetooth LE standards
- Class-1, class-2 and class-3 launchers
- AFH
- CVSD and SBC

operating conditions

- Operating voltage/supply voltage: 3.0 ~ 3.6 V
- operating temperature: -40 ~ 85 °C

1.2 Description

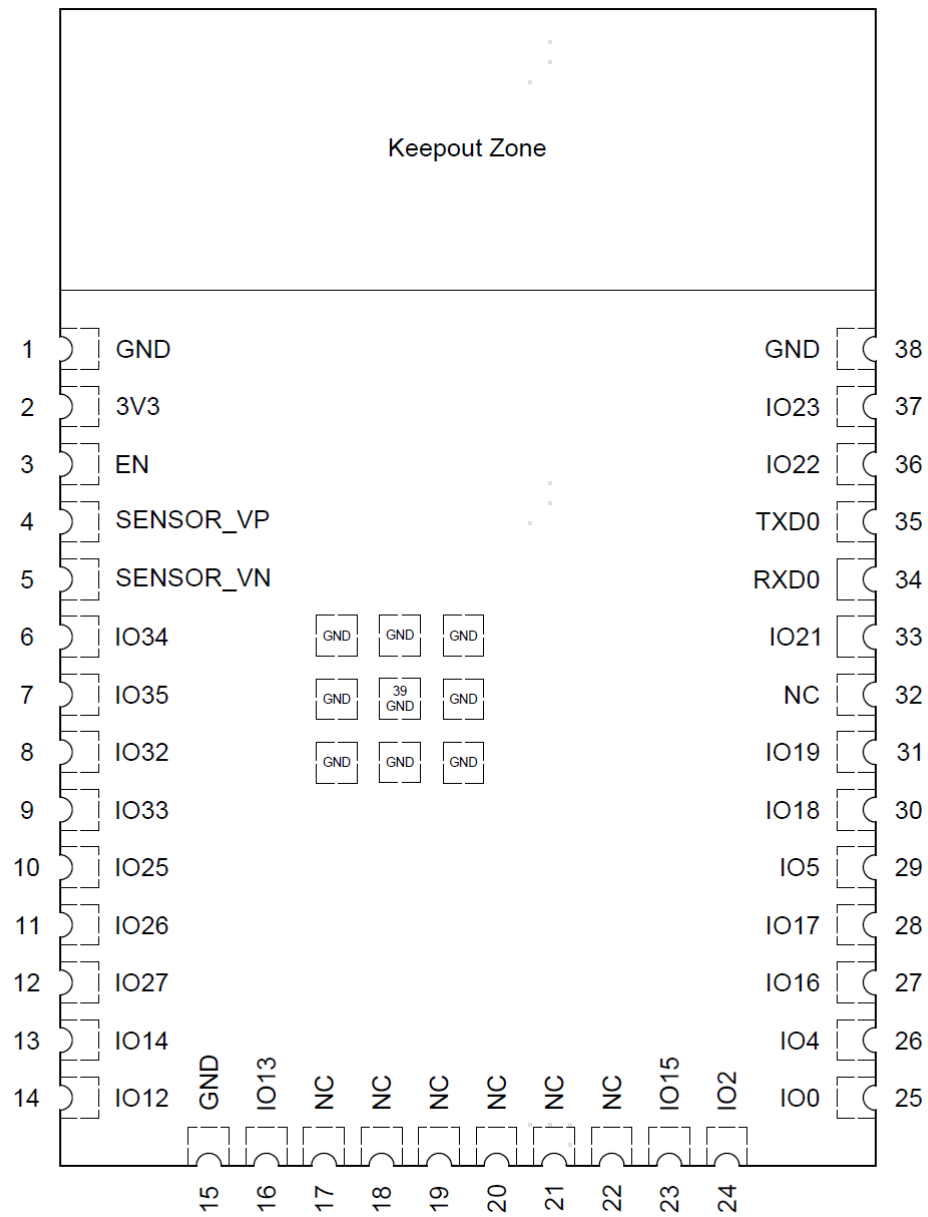
EFESP32UE is a versatile Wi-Fi + Bluetooth + Bluetooth LE MCU module that is powerful and versatile for use in low-power sensor networks and extremely demanding tasks.

The module integrates traditional Bluetooth, Bluetooth Low Energy and Wi-Fi, and has a wide range of uses: Wi-Fi supports a wide range of communication connections, as well as direct connection to the Internet through a router; Bluetooth allows users to connect to a mobile phone or broadcast a BLE Beacon for signal detection.

The module supports data transfer rates up to 150 Mbps and antenna output power up to 20 dBm for maximum range wireless communication. As a result, this module has industry-leading technical specifications and excellent performance in terms of high integration, wireless transmission distance, power consumption and network connectivity.

2 Pin definition

2.1 Pin layout



2.2 Pin definition

Name	No.	Type ¹	Function
GND	1	P	Ground
3V3	2	P	Power supply
EN	3	I	High: On; enables the chip Low: Off; the chip shuts down Note: Do not leave the pin floating.
SENSOR_VP	4	I	GPIO36, ADC1_CH0, RTC_GPIO0
SENSOR_VN	5	I	GPIO39, ADC1_CH3, RTC_GPIO3
IO34	6	I	GPIO34, ADC1_CH6, RTC_GPIO4
IO35	7	I	GPIO35, ADC1_CH7, RTC_GPIO5
IO32	8	I/O	GPIO32, XTAL_32K_P (32.768 kHz crystal oscillator input), ADC1_CH4, TOUCH9, RTC_GPIO9
IO33	9	I/O	GPIO33, XTAL_32K_N (32.768 kHz crystal oscillator output), ADC1_CH5, TOUCH8, RTC_GPIO8
IO25	10	I/O	GPIO25, DAC_1, ADC2_CH8, RTC_GPIO6, EMAC_RXD0
IO26	11	I/O	GPIO26, DAC_2, ADC2_CH9, RTC_GPIO7, EMAC_RXD1
IO27	12	I/O	GPIO27, ADC2_CH7, TOUCH7, RTC_GPIO17, EMAC_RX_DV
IO14	13	I/O	GPIO14, ADC2_CH6, TOUCH6, RTC_GPIO16, MTMS, HSPICLK, HS2_CLK, SD_CLK, EMAC_TXD2
IO12	14	I/O	GPIO12, ADC2_CH5, TOUCH5, RTC_GPIO15, MTDI, HSPIQ, HS2_DATA2, SD_DATA2, EMAC_TXD3
GND	15	P	Ground
IO13	16	I/O	GPIO13, ADC2_CH4, TOUCH4, RTC_GPIO14, MTCK, HSPID, HS2_DATA3, SD_DATA3, EMAC_RX_ER
NC	17	-	NC
NC	18	-	NC
NC	19	-	NC
NC	20	-	NC
NC	21	-	NC
NC	22	-	NC
IO15	23	I/O	GPIO15, ADC2_CH3, TOUCH3, MTDO, HSPICS0, RTC_GPIO13, HS2_CMD, SD_CMD, EMAC_RXD3
IO2	24	I/O	GPIO2, ADC2_CH2, TOUCH2, RTC_GPIO12, HSPWP, HS2_DATA0, SD_DATA0
IO0	25	I/O	GPIO0, ADC2_CH1, TOUCH1, RTC_GPIO11, CLK_OUT1, EMAC_TX_CLK
IO4	26	I/O	GPIO4, ADC2_CH0, TOUCH0, RTC_GPIO10, HSPID, HS2_DATA1, SD_DATA1, EMAC_TX_ER
IO16 ³	27	I/O	GPIO16, HS1_DATA4, U2RXD, EMAC_CLK_OUT
IO17	28	I/O	GPIO17, HS1_DATA5, U2TXD, EMAC_CLK_OUT_180
IO5	29	I/O	GPIO5, VSPICS0, HS1_DATA6, EMAC_RX_CLK
IO18	30	I/O	GPIO18, VSPICLK, HS1_DATA7

Cont'd on next page

Name	No.	Type ¹	Function
IO19	31	I/O	GPIO19, VSPIQ, U0CTS, EMAC_TXD0
NC	32	-	-
IO21	33	I/O	GPIO21, VSPIHD, EMAC_TX_EN
RXD0	34	I/O	GPIO3, U0RXD, CLK_OUT2
TXD0	35	I/O	GPIO1, U0TXD, CLK_OUT3, EMAC_RXD2
IO22	36	I/O	GPIO22, VSPIWP, U0RTS, EMAC_TXD1
IO23	37	I/O	GPIO23, VSPID, HS1_STROBE
GND	38	P	Ground

3 Electrical Characteristics

3.1 WiFi RF Characteristics

3.1.1 Transmitter Characteristics

Target TX power is configurable based on device or certification requirements. The default characteristics:

Rate	Typ (dBm)
11b, 1 Mbps	19.5
11b, 11 Mbps	19.5
11g, 6 Mbps	18
11g, 54 Mbps	14
11n, HT20, MCS0	18
11n, HT20, MCS7	13
11n, HT40, MCS0	18
11n, HT40, MCS7	13

3.1.2 Receiver Characteristics

Rate	Typ (dBm)
1 Mbps	-97
2 Mbps	-94
5.5 Mbps	-92
11 Mbps	-88

Rate	Typ (dBm)
6 Mbps	-93
9 Mbps	-91
12 Mbps	-89
18 Mbps	-87
24 Mbps	-84
36 Mbps	-80
48 Mbps	-77
54 Mbps	-75
11n, HT20, MCS0	-92
11n, HT20, MCS1	-88
11n, HT20, MCS2	-86
11n, HT20, MCS3	-83
11n, HT20, MCS4	-80
11n, HT20, MCS5	-76
11n, HT20, MCS6	-74
11n, HT20, MCS7	-72
11n, HT40, MCS0	-89
11n, HT40, MCS1	-85
11n, HT40, MCS2	-83
11n, HT40, MCS3	-80
11n, HT40, MCS4	-76
11n, HT40, MCS5	-72
11n, HT40, MCS6	-71
11n, HT40, MCS7	-69

3.2 Bluetooth Radio

3.2.1 Transmitter Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
RF transmit power	—	—	0	—	dBm
Gain control step	—	—	3	—	dB
RF power control range	—	-12	—	+9	dBm
Adjacent channel transmit power	$F = F_0 \pm 2 \text{ MHz}$	—	-55	—	dBm
	$F = F_0 \pm 3 \text{ MHz}$	—	-57	—	dBm
	$F = F_0 \pm > 3 \text{ MHz}$	—	-59	—	dBm
$\Delta f_{1\text{avg}}$	—	—	—	265	kHz
$\Delta f_{2\text{max}}$	—	210	—	—	kHz
$\Delta f_{2\text{avg}}/\Delta f_{1\text{avg}}$	—	—	+0.92	—	—
ICFT	—	—	-10	—	kHz
Drift rate	—	—	0.7	—	kHz/50 μs
Drift	—	—	2	—	kHz

3.2.2 Transmitter Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity @30.8% PER	—	-94	-93	-92	dBm
Maximum received signal @30.8% PER	—	0	—	—	dBm
Co-channel C/I	—	—	+10	—	dB
Adjacent channel selectivity C/I	$F = F_0 + 1 \text{ MHz}$	—	-5	—	dB
	$F = F_0 - 1 \text{ MHz}$	—	-5	—	dB
	$F = F_0 + 2 \text{ MHz}$	—	-25	—	dB
	$F = F_0 - 2 \text{ MHz}$	—	-35	—	dB
	$F = F_0 + 3 \text{ MHz}$	—	-25	—	dB
	$F = F_0 - 3 \text{ MHz}$	—	-45	—	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	-10	—	—	dBm
	2000 MHz ~ 2400 MHz	-27	—	—	dBm
	2500 MHz ~ 3000 MHz	-27	—	—	dBm
	3000 MHz ~ 12.5 GHz	-10	—	—	dBm
Intermodulation	—	-36	—	—	dBm

4. Integration Instructions

4.1 General

Host product manufacturers must follow 4.2 to 4.12 when integrating modules into host products.

4.2 List of applicable FCC rules

The module complies with FCC Part 15.247, FCC Part 15.249 and Canada RSS-247, RSS-210. It is applicable to the modular transmitter.

4.3 Summarize the specific operational use conditions

This radio transmitter FCC ID: 2A2P9-ESP32WROOM32E and IC: 27618-ESP32UE have been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device. The concrete contents to check are the following three points.

- 1) Must use an antenna such as PCB Antenna with a gain not exceeding 6.04 dBi for BT and WIFI;
- 2) Should be installed so that the end user cannot modify the antenna;
- 3) Feed line should be designed in 50ohm

Fine-tuning of return loss etc. can be performed using a matching network. The antenna shall not be accessible for modification or change by the end user. A modification to the antenna is required FCC/ISED Class II permissive change.

This device has been approved as mobile device in accordance with FCC and ISED Canada RF exposure requirements. This means that a restricted minimum separation distance of 20cm between the antenna and any person.

A change in use that involves a separation distance $\leq 20\text{cm}$ (Portable usage) between the Module's antenna and any persons is a change in the RF exposure of the module and, hence, is subject to a FCC Class 2 Permissive Change and a ISED Canada Class 4 Permissive Change policy in accordance with FCC KDB 996396 D01 and ISED Canada RSP-100.

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. the module could be subject to a FCC Class 2 Permissive Change and a ISED Canada Class 4 Permissive Change policy in accordance with FCC KDB 996396 D01 and ISED Canada RSP-100. I

4.4 Limited module procedures

Not applicable.

4.5 Trace antenna designs

Not applicable. The antenna connector is in the module, there no trance antenna designs.

4.6 RF exposure consideration

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This compliance to FCC radiation exposure limits for an uncontrolled environment, and minimum of 20cm separation between antenna and body.

The host product shall show the same or similar statement to the end users in the end-product manuals.

If the module is installed to a host / end product with a used distance <20cm, additional SAR evaluation or measurement must be followed according to FCC KDB 447498 and RSS-102.

If the module is installed to a host / end product with multiple transmitters, additional RF exposure evaluation must be performed for the simultaneous transmission condition per FCC KDB 447498 and RSS-102. A Formula is also showed below:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

The procedure rules are provided in 4.3 in this document. As the module manufacturer is still taking responsibility for the compliance of this module, if you have any changes mentioned above, you must advise and get the help from us with the contact information as shown below 4.12.

4.7 Antennas

Antenna connector: IPEX connector.

Antennas requirements and antenna gain

Antenna type	Antenna gain
PCB Antenna	2400-2483.5MHz: Max Gain: 6.04dBi

4.8 Label and compliance information

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. That displays the contents shown in below:

Contains FCC ID: 2A2P9-ESP32WROOM32E

Contains IC: 27618-ESP32UE

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.

4.9 Information on test modes and additional testing requirements

Additional testing requirements should be taking into account for different operating conditions for the transmitter function.

If this module is operated as a stand-alone modular in a host:

- ❖ Radiated spurious emission per FCC Part 15.247, 15.249 and RSS247, RSS-210.
- ❖ The host should be operated in all its normal mode with the modular transmitter active.
- ❖ Please follow 4.11 in this document to obtain a best radio engineer design.

If this module is operated as multiple simultaneously transmitting modules in a host:

- ❖ Foundation frequency power, Radiated spurious emission per FCC Part 15.249 and RSS-210.
Conducted spurious emission and conducted power per FCC part 15.247 and RSS-247.
- ❖ Please contact the modular manufacturer through the contact information shown below 4.12 to get the test software.
- ❖ This module should be operated in transmitter mode with other transmitter for the simultaneous condition.
- ❖ Please follow 4.11 in this document to obtain a best radio engineer design.
- ❖ The procedure rules are provided in 4.3 in this document. As the module manufacturer is still taking responsibility for the compliance of this module, if you have any changes mentioned above, you must advise and get the help from us with the contact information as shown below 4.12.

4.10 Additional testing, Part 15 Subpart B disclaimer

Statement:

The module complies with and authorized for transmitter rule: FCC Part 15.247, FCC Part 15.249 and Canada RSS-247, RSS-210. However, the host may also contain other unintentional-radiator digital functions / circuits. This digital functions / circuits are required additional FCC / ISED rules: FCC part 15B and relevant ICES standard, which are not covered by the modular certification. The host manufacturer is responsible for compliance to this additional FCC / ISED rules. And the host manufacturer should state the FCC / ISED SDOC compliance information.

4.11 Note EMI Considerations

EMI consideration for transmitting simultaneously:

This module is stand-alone modular. If the end product has multiple certified modules integrated in a host and transmitting simultaneously: When after radiated emission testing, if there are no additional emissions generated due to simultaneous-transmission operations compared to single transmitter operations testing, it is not necessary to file the additional simultaneous transmission test data. FCC class II permissive changes is no necessary.

However, RF exposure for transmitting simultaneously also needed, please refer to 4.6 in this document.

To obtain better engineer design while installing this module:

It is recommended to place the module as close as possible to the edge of the baseplate. If conditions permit, make the antenna feed point closest to the edge of the baseplate. Please ensure that the module is not covered by any metal shell. Do not lay copper, wire, or place components in the

antenna area of the module PCB.

4.12 How to make changes

Only the module grantee is permitted to make permissive changes. If the host integrator is expected to install the module in a way different from this manual or want to change the module, please contact:

Company: EcoFlow Inc.

Address: 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian Community, Shiyan Street, Bao'an District, Shenzhen Guangdong China

Telephone No: 0755-86660185

Email: david.wu@ecoflow.com

5. FCC/IC statements

5.1 FCC statements:

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.

Warning: 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.

This equipment complies with FCC's and IC's RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed and operated to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. Installers must ensure that 20cm separation distance will be maintained between the device and users.

5.2 ISED statements:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- 1) L'appareil ne doit pas produire de brouillage;
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC's RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed and operated to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. Installers must ensure that 20cm separation distance will be maintained between the device and users.

L'appareil est conforme aux limites d'exposition aux rayonnements RF spécifiées par IC pour les environnements non contrôlés. L'antenne utilisée pour cet émetteur doit être installée et exploitée de manière à assurer une distance d'isolement d'au moins 20 cm de toute personne et ne doit pas être juxtaposée ou fonctionner en synergie avec une autre antenne ou un autre émetteur.

L'installateur doit s'assurer qu'un espacement de 20 cm est maintenu entre l'appareil et l'utilisateur.