

TEST REPORT

of

RE Directive (2014/53/EU) EN50566: 2017 / EN50663: 2017

Product : ESP32 WROOM-32 module

Brand Name: Fanstel

Model: ESP32M4; ESP32E4; ESP32M16; ESP32E16;
ESP32F16; ESP32F4

Model Difference: Memory , Antenna . Please see page 5 for detail

Applicant: Fanstel Corporation, Taipei

Address: 10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd.,
Hsi-Chih, New Taipei City 221 Taiwan

Test Performed by:

International Standards Laboratory Corp.

<LT Lab.>

*Address:

No. 120, Lane 180, Hsin Ho Rd.,

Lung-Tan Dist., Tao Yuan City 325, Taiwan

*Tel : 886-3-407-1718; Fax: 886-3-407-1738

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Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

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VERIFICATION OF COMPLIANCE

Applicant: Fanstel Corporation, Taipei
Equipment Under Test: ESP32 WROOM-32 module
Brand Name: Fanstel
Model Number: ESP32M4; ESP32E4; ESP32M16; ESP32E16; ESP32F16;
 ESP32F4
Model Different: Memory , Antenna . Please see page 5 for detail
Date of Test: 2020/02/20 ~ 2020/03/27
Date of EUT Received: 2020/02/20

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
EN50566: 2017 EN50663: 2017	Complied

The above equipment was tested by International Standards Laboratory Corp. for compliance with the requirements set forth in the European Standard EN 50566: 2017 and EN 50663: 2017 under 3.1 (a) of RE Directive 2014/53/EU. The results of in this report apply to the product system that was used only.

Test By:	<u>Weitin Chen</u>	Date:	<u>2020/03/30</u>
	Weitin Chen / Senior Engineer		
Prepared By:	<u>Gigi yeh</u>	Date:	<u>2020/03/30</u>
	Gigi Yeh / Senior Engineer		
Approved By:	<u>Jerry Liu</u>	Date:	<u>2020/03/30</u>
	Jerry Liu / Technical Manager		

Version

Version No.	Date	Description
00	2020/03/30	Initial creation of document

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1. Description of Equipment under Test (EUT)

General:

Product Name:	ESP32 WROOM-32 module
Brand Name:	Fanstel
Model Name:	ESP32M4; ESP32E4; ESP32M16; ESP32E16; ESP32F16; ESP32F4
Model Difference:	Antenna. Please see table below for detail.
Type of Equipment:	Stand-alone equipment
Temperature Range:	-40°C to + 105°C
Simultaneous transmissions:	Yes
Geo-location capability:	No
Power Supply	5Vdc by USB port

Model Summaries

module	ESP32M4	ESP32F4.	ESP32E4.	ESP32M16	ESP32F16	ESP32E16.
SoC	ESP32-D0WD	ESP32-D0WD	ESP32-D0WD	ESP32-D0WD	ESP-D0WD	ESP32-D0WD
Flash memory	4MB, IS25LP032-JBLE	4MB, IS25LP032-JBLE	4MB, IS25LP032-JBLE	16MB, IS25LP128-JBLE	16MB, IS25LP128-JBLE	16MB, IS25LP128-JBLE
Size	18x25.5	18x25.5	18x25.5	18x25.5	20x29.5	18x25.5
WIFI Antenna	PCB trace	PCB trace	u.FL	PCB trace	PCB trace	u.FL
Max TX						
Operating temp.	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C
Price at 1K pcs	\$3.46			\$4.33		\$4.49
Availability				Sample 03/2020		Sample 03/2020

2.4GHz WLAN: 1TX/1RX SISO

Frequency Range:	2412MHz–2472MHz
Channel number:	802.11b/g: 13channels 802.11n_HT20: 13 channels 802.11n_HT40: 11 channels
Transmit Power (EIRP):	802.11b:17.92dBm 802.11g:19.82 dBm 802.11n_HT20:19.92 dBm 802.11n_HT40:19.92 dBm
Modulation Technology:	DSSS, OFDM
Antenna Designation:	PCB Antenna ESP32M : 2.22 dBi ESP32F: 1.70 dBi Dipole Antenna ESP32E : 0dBi
Modulation type:	CCK, DQPSK, DBPSK for DSSS 256QAM.64QAM. 16QAM, QPSK, BPSK for OFDM
TPC feature:	No
DFS operation mode:	N/A
Ad-hoc mode:	No.
Occupied Channel Bandwidth:	Within 2400-2483.5MHz,
Duty Cycle:	N/A
Adaptive/ Non-Adaptive:	Adaptive
LBT based Detect and Avoid:	Load Based Equipment
Antenna Beamforming:	No

The EUT is compliance with IEEE 802.11 b/g/n Standard.

This test report applies for 2.4GHz wifi.

2. Description of Test Modes

The EUT has been tested under Operating condition. And used to control the EUT for staying in continuous transmitting mode is programmed. Channel low, mid, and High for each modulation type are chosen for testing.

3. General Description of Applied Standards

The EUT According to the Specifications, it must comply with the requirements of the following standards:

EN 50566: 2017 – Product standard to demonstrate the compliance of wireless communication devices with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 30 MHz to 6 GHz: hand-held and body mounted devices in close proximity to the human body

EN 50663: 2017 – Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz)

EN 62311: 2008 – Generic standard to demonstrate the compliance of electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0Hz-300GHz)

EN 62479: 2010 – Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10MHz to 300GHz)

4. RF Exposure Evaluations

According to section 4.2 Low-power exclusion level (P_{\max}) of EN 62479: 2010 . and Annex A, Table A.1 – Example values of SAR-based P_{\max} for some cases described by ICNIRP, IEEE Std C95.1-1999 and IEEE Std C95.1-2005

Table A.1 – Example values of SAR-based P_{\max} for some cases described by ICNIRP, IEEE Std C95.1-1999 and IEEE Std C95.1-2005

Guideline / Standard	SAR limit, SAR_{\max} W/kg	Averaging mass, m g	P_{\max} mW	Exposure tier ^a	Region of body ^a
ICNIRP [1]	2	10	20	General public	Head and trunk
	4	10	40	General public	Limbs
	10	10	100	Occupational	Head and trunk
	20	10	200	Occupational	Limbs
IEEE Std C95.1-1999 [2]	1,6	1	1,6	Uncontrolled environment	Head, trunk, arms, legs
	4	10	40	Uncontrolled environment	Hands, wrists, feet and ankles
	8	1	8	Controlled environment	Head, trunk, arms, legs
	20	10	200	Controlled environment	Hands, wrists, feet and ankles
IEEE Std C95.1-2005 [3]	2	10	20	Action level	Body except extremities and pinnae
	4	10	40	Action level	Extremities and pinnae
	10	10	100	Controlled environment	Body except extremities and pinnae
	20	10	200	Controlled environment	Extremities and pinnae

^a Consult the appropriate standard for more information and definitions of terms.

4.2. Classification of the assessment method:

The antenna of the product, under normal use condition is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20 cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \frac{\sqrt{30PG(\theta, \phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
 θ, ϕ = elevation and azimuth angles to point of investigation
 r = distance from observation point to the antenna

4.3. EUT operating condition:

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.4. Test Results:

E-Field Strength Calculation: EN 62311: 2008

Ambient temperature: 25°C Relative humidity: 60% Test Date: 2020/03/22

Antenna Gain= 2.22 dBi
Distance to human body= 20 cm
Duty Cycle= 0.99

802.11b

Frequency	EIRP (dBm)	EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS/ FAIL
2412.00	16.12	40.93	7.12	61.00	PASS
2437.00	16.42	43.85	7.37	61.00	PASS
2472.00	17.92	61.94	8.76	61.00	PASS

802.11g

Frequency	EIRP (dBm)	EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS/ FAIL
2412.00	19.82	95.94	10.90	61.00	PASS
2437.00	19.72	93.76	10.77	61.00	PASS
2472.00	19.52	89.54	10.53	61.00	PASS

802.11n_HT20

Frequency	EIRP (dBm)	EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS/ FAIL
2412.00	19.72	93.76	10.77	61.00	PASS
2437.00	19.92	98.17	11.02	61.00	PASS
2472.00	19.42	87.50	10.41	61.00	PASS

Evaluation Results:

The Calculation of E-Field Strength is less than EN 62311 E-Field Strength limit 61V/m at 2.4GHz.

Antenna Gain= 2.22 dBi
 Distance to human body= 20 cm
 Duty Cycle= 0.99

802.11n_HT40

Frequency	EIRP (dBm)	EIRP (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS/ FAIL
2422.00	19.82	95.94	10.90	61.00	PASS
2437.00	19.92	98.17	11.02	61.00	PASS
2462.00	19.62	91.62	10.65	61.00	PASS

APPENDIX 1

Photographs of EUT

Refer to ISL-20LR045E328

~ End of Report ~