E103-RTL8189FTV User Manual

RTL8189FTV 2.4GHz Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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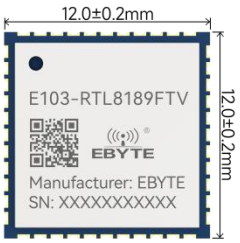
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1 Introduction

1.1 Brief Introduction



E103-RTL8189FTV is a low-cost, high-performance WiFi module based on Realtek RTL8189FTV-VC-CG.It complies with IEEE 802.11b/g/n standards, has a maximum data rate of 150Mbps, has rich interfaces and a powerful processor, and provides a complete solution for integrated wireless LAN devices with high throughput performance.

1.2 Features

- The operating frequency band is 2.4GHz～2.484GHz, and supports the global license-free ISM 2.4GHz band;
- The wireless rate can reach up to 150Mbps;
- Complies with IEEE 802.11b/g/n protocol standards;
- Supports 20/40 channel bandwidth;
- Communication interface is SDIO 2.0;
- Operating temperature: 0～＋70℃;
- Widely used in the Internet of Things;

1.3 Application s

- Wifi video transmission;
- Wifi audio transmission;
- Router;
- Wifi repeater;
- Serial port forwarding and other general-purpose modules for smart homes;
- Cloud service applications;
- IoT gateway;

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2 Specification and parameter

2.1 Basic parameters

RF parameters	Unit	Numeric value	Remarks
transmitting power	dBm	15 to 17 (Typical value is 16)	
WiFi protocol	-	IEEE 802.11b/g/n	
reference distance	M	200	Antenna gain 5 dBi, and the module has communication with the device end
CI	-	SDIO 2.0	
Work frequency band	GHz	2.4～2.484	Support global ISM free ISM 2.4 GHz band
working temperature	℃	0~70	
Working humidity	RH	10%~95%	No condensation

2.2 Electrical parameters

2.2.1 Recommended conditions of use

Parameter		Min	Typ	Max	Units
working temperature		0	25	70	℃
External antenna standing wave		-	1.7	2.1	/
service voltage	VDD33	3.0	3.3	3.5	V
	VDDIO	1.7	1.8	1.9	V
		3.0	3.3	3.5	V

2.2.2 3.3V GPIO Interface power specifications

Symbol	Parameter	Min	Typ	Max	Unit
VIH	Input High Voltage	2.0	3.3	3.5	V
VIL	Input Low Voltage	-	0	0.9	V

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VOH	Output High Voltage	3.0	-	3.3	V
VOL	Output Low Voltage	0	-	0.33	V

2.2.3 1.8V GPIO Interface power specifications

Symbol	Parameter	Min	Typ	Max	Unit
VIH	Input High Voltage	1.7	1.8	1.9	V
VIL	Input Low Voltage		0	0.8	V
VOH	Output High Voltage	1.6	one	1.8	V
VOL	Output Low Voltage	0		0.18	V

2.2.3 Current consumption

Test condition	VDD33 Current (average value)		
	Typ	Max	Unit
WLAN Unassociated (Linux Driver)	41	50	mA
2.4G 11b@1Mbps TX@17dBm(1RF test)	272	319	mA
2.4G 11b@1Mbps RX(1RF test)	61	69	mA
2.4G 11b@11Mbps TX@17dBm(1RF test)	283	318	mA
2.4G 11b@11Mbps RX(1RF test)	56	68	mA
2.4G 11g@6Mbps TX@17dBm(1RF test)	267	283	mA
2.4G 11g@6Mbps RX(1RF test)	61	69	mA
2.4G 11g@54Mbps TX@14dBm(1RF test)	262	269	mA
2.4G 11g@54Mbps RX(1RF test)	61	65	mA
2.4G 11n@HT20_MCSO TX@16dBm(1RF test)	274	288	mA
2.4G 11n@HT20_MCS0 RX(1RF-Test)	59	70	mA
2.4G 11n@HT20_MCS7TX@14dBm(1RF test)	265	282	mA
2.4G 11n@HT20_MCS7 RX(1RF-Test)	59	70	mA
2.4G 11n@HT40_MCS7 TX@14dBm(1RF test)	275	290	mA
2.4G 11n@HT40_MCS7 RX(1RF-Test)	60	79	mA

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Note: Use the electrical parameter VDD33=3.3V, operating temperature: 25℃

2.3 Hardware Parameters

Hardware parameters	Parameter details	Remarks
slug	RTL8189FTV-VC-CG	
Packaging method	paster	
Antenna interface	Stamp hole	The characteristic impedance is about 50 ohms
CI	SDIO 2.0	
size	12*12*1.9mm	The error size is ± 0.2mm
weight	0.69g	The error is ± 0.1g

3 Size and pin definition

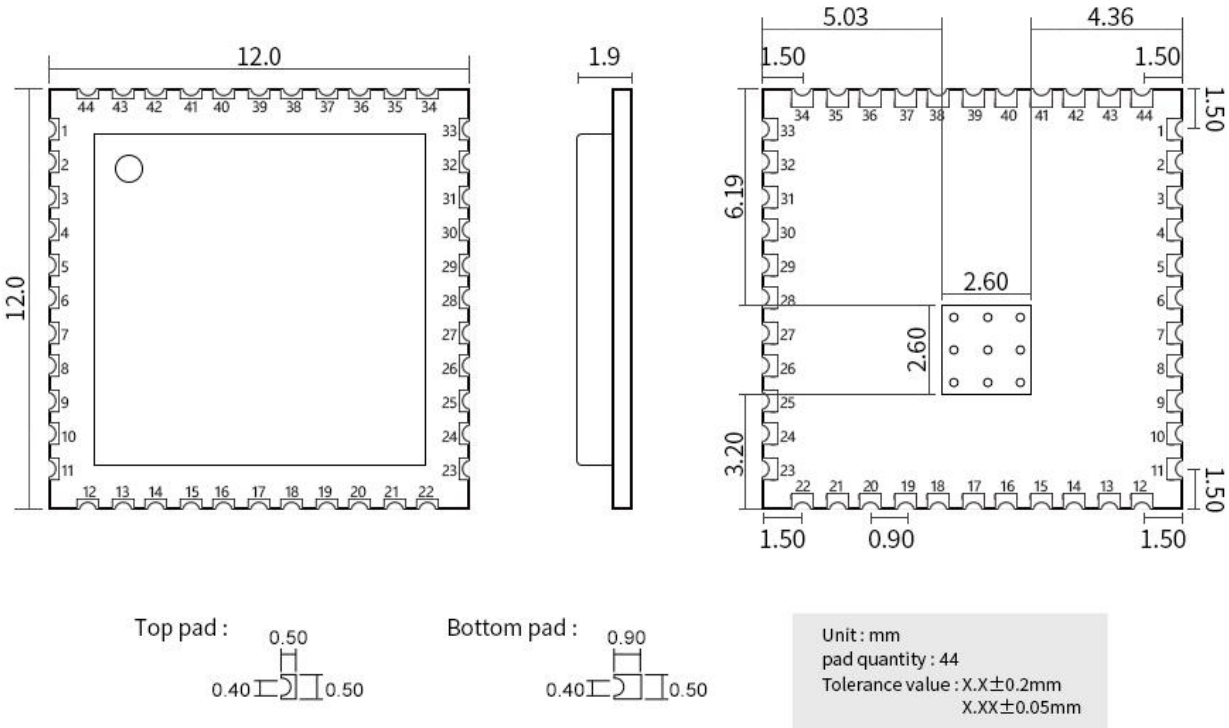


Figure 1: E103-RTL8189FTV dimensional drawing

Note: The welding pad at the bottom of the module PCB is used for the cooling of the module window, which has been grounded, and users do not need to pay attention to it.

PIN number	Name	Pound type	Description of the pin function
1	GND	RF	Antenna ground foot

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2	WLAN ANT	RF	Antenna pins, stamp holes
3	GND	RF	Antenna ground foot
4	NC	/	
5	NC	/	
6	NC	/	
7	NC	/	
8	NC	/	
9	VDD33	P	3.3V DC power supply
10	NC	/	
11	NC	/	
12	CHIP_EN		When the module is pulled down, this pin can close the module from the outside. Internal high pull by 100K resistance
13	WAKE HOST	0	Shared with the GPIO 0. The WLAN uses this pin to wake up the host
14	SD_D2	I/0	SDIO line 2
15	SD_D3	I/0	SDIO line 3
16	SD_CMD	I/0	SDIO command input
17	SD_CLK		SDIO clock input
18	SD_D0	I/0	The SDIO data line is in 0
19	SD_D1	I/0	The SDIO data line 1
20	GND	P	the earth
21	NC	/	
22	VDDIO	P	This power supply is power for SDIO and other digital I / O. Depending on the customer application platform, select 3.3V or 1.8V power input
23	NC	/	
24	NC	/	
25	NC		
26	NC		
27	NC	/	

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28	NC	/	
29	NC	/	
30	NC	/	
31	GND	P	the earth
32	NC	/	
33	GND	P	the earth
34	NC	/	
35	NC	/	
36	GND	P	the earth
37	NC		
38	NC		
39	NC	/	
40	NC		
41	NC		
42	NC		
43	NC	/	
44	NC	/	

4 WiFi Protocol Characteristics

4.1 Parameter characteristics

Characteristic	Parameter details
protocol standard	IEEE 802.11b/g/n CSMA/CA
Work frequency band	2.4~2.484GHz(2.4GHz ISM Band)
channel	Ch1~Ch14(For 20MHz Channels)
modulation mode	802.11b (DSSS):DBPSK,DQPSK,CCK; 802.11g (OFDM):BPSK,QPSK,16QAM,64QAM; 802.11n (OFDM):BPSK,QPSK,16QAM,64QAM;

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transmission speed	802.11b:1,2,5.5,11Mbps; 802.11g:6,9,12,18,24,36,48,54Mbps; 802.11n(HT20):MCS0~MCS7(1T1R_SISO)6.5~72.2Mbps; 802.11n(HT40):MCS0~MCS7(1T1R_SISO)13.5~150Mbps;
Frequency bias tolerance	≤±20ppm
Operating conditions: VDD33=3.3V; operating temperature: 25℃	

4.2 Transmitter parameters

Transmission speed	Emission power (dBm)	Power deviation (dBm)	EVM(dB)
802.11b@1Mbps	Recommended Target TX Power =17	±1	≤-10dB
802.11b@11Mbps	Calibrated TX Power =17	±1	≤-10dB
802.11g@6Mbps	Recommended Target TX Power ≤16	±2	≤-10dB
802.11g@54Mbps	Calibrated TX Power =14	±2	≤-25dB
802.11n@HT20_MCSO	Recommended Target TX Power ≤16	±2	≤-10dB
802.11n@HT20_MCS7	Calibrated TX Power =14	±2	≤-28dB
802.11n@HT40_MCSO	Recommended Target TX Power ≤16	±2	≤-10dB
802.11n@HT40_MCS7	Calibrated TX Power =14	±2	≤-28dB

4.3 Receiver Parameters

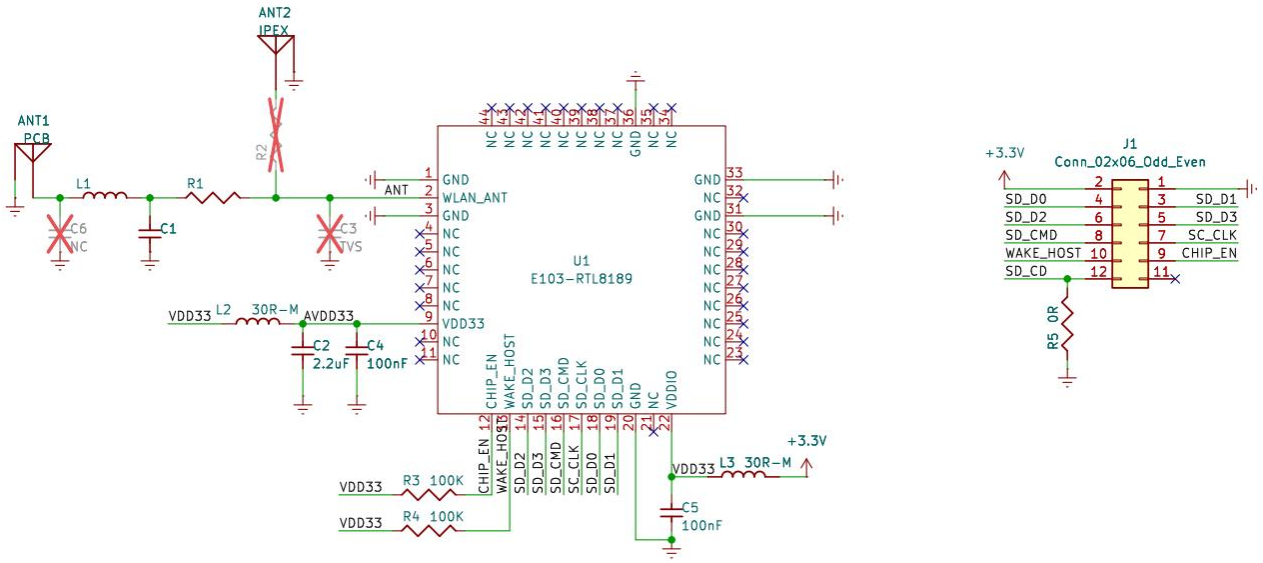
Receive rate	Min Input Level(dBm)	Max Input Level(dBm)	PER
802.11b@1Mbps	-92	-10	<8%
802.11b@11Mbps	-86	-10	<8%
802.11g@6Mbps	-90	-15	<10%
802.11g@54Mbps	-72	-15	<10%
802.11n@HT20_MCSO	-88	-15	<10%
802.11n@HT20_MCS7	-67	-15	<10%

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802.11n@HT40_MCSO	-86	-15	<10%
802.11n@HT40_MCS7	-66	-15	<10%

5 Recommended circuit diagram



6 FAQ

6.1 Communication range is too short

- The communication distance will be affected when obstacle exists;
- Data lose rate will be affected by temperature, humidity and co-channel interference;
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground;
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea;
- The signal will be affected when the antenna is near metal object or put in a metal case;
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance);
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power;
- Due to antenna quality or poor matching between antenna and module.

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6.2 Module is easy to damage

- Please check the power supply source, ensure it is 2.0V~3.6V, voltage higher than 3.6V will damage the module;
- Please check the stability of power source, the voltage cannot fluctuate too much;
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility;
- Please ensure the humidity is within limited range, some parts are sensitive to humidity;
- Please avoid using modules under too high or too low temperature.

7 Production guidance

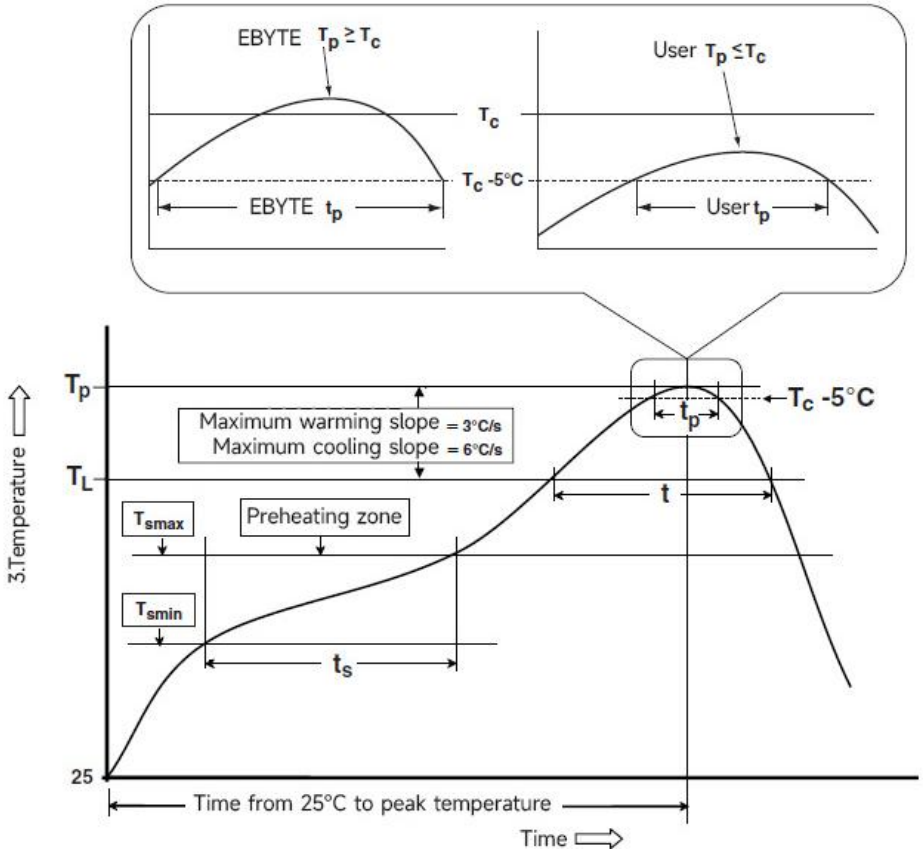
7.1 Reflow soldering temperature

Reflow weld curve characteristics		Lead process assembly	Lead-free process assembly
Preheat / heat preservation	Minimum Temperature (Tsmin)	100℃	150℃
	Maximum Temperature (Tsmax)	150℃	200℃
	Time (Tsmin to Tsmin)	For the 60-120 seconds	For the 60-120 seconds
Temperature rise slope (TL ~ Tp)		At 3℃ / s, with the maximum value	At 3℃ / s, with the maximum value
Liquid-phase temperature (TL)		183℃	217℃
Hold time above the TL		60~90 Seconds	60~90 Seconds
Package bulk peak temperature Tp		The user must not exceed the temperature specified on the "Humidity sensitivity" label of the product.	The user must not exceed the temperature specified on the "Humidity sensitivity" label of the product.
Time (Tp) within 5℃ of the specified grade temperature (Tc), shown in the figure below		20 Seconds	30 Seconds
Cooling slope (Tp ~ TL)		6℃ / s, max	6℃ / s, max
Time from the room temperature to the peak temperature		Six minutes, the longest	8 Minutes, longest
The peak temperature (Tp) tolerance of the temperature curve is defined as the upper limit of the user			

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7.2 Reflow soldering curve



8 Antenna recommendation

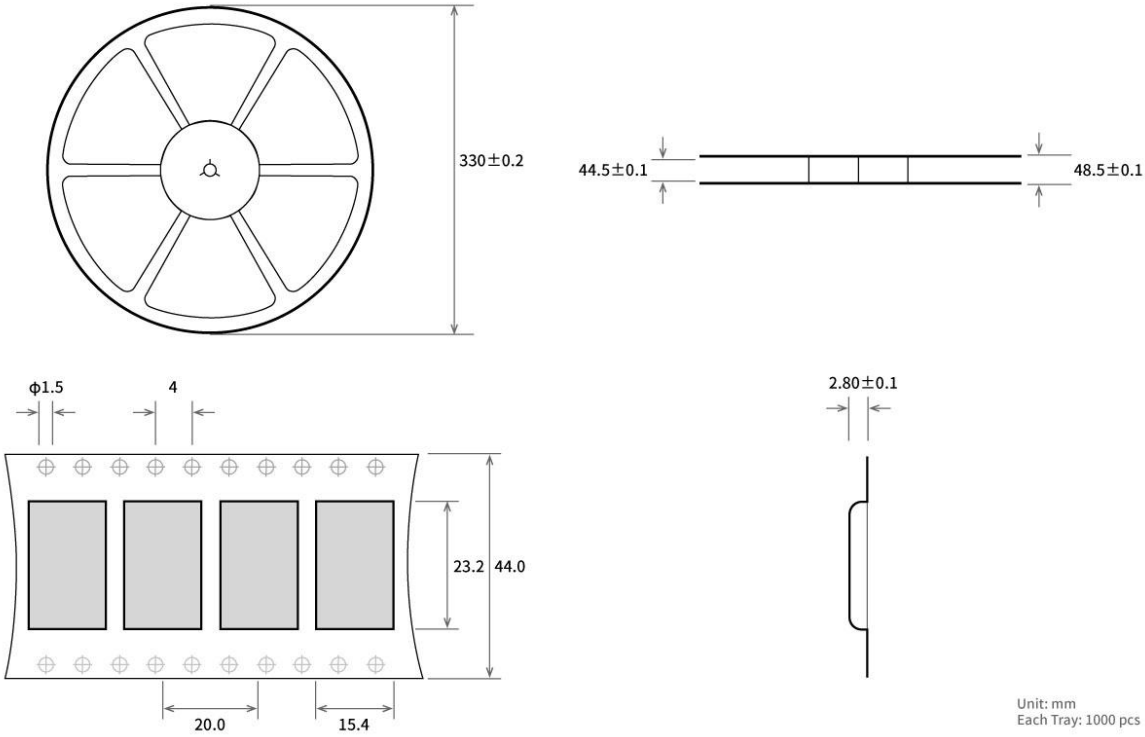
Antenna is an important role in the communication process, and often inferior antenna will have a great impact on the communication system, so our company recommends some antennas as antennas supporting our wireless modules with excellent performance and reasonable price.

Product model	Type	Frequency	Gain	Size	Cable	Interface	Feature
		Hz	dBi	mm	c m		
TX2400-JKD-20	Rubber antenna	2.4G	5.0	13x 175x25	-	SMA-J	Fix the bent, omnidirectional antenna
TX2400-JK-11	Rubber antenna	2.4G	2.5	8x90x10	-	SMA-J	Fix the bent, omnidirectional antenna
TX2400-JZLW-15	Rubber antenna	2.4G	5.0	165	-	IPEX-1	Straight,omnidirectional antenna

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9 Bulk packaging method



Revision history

Version	Revised date	Revision note	Maintain people
1.0	2024-8-6	The initial version	Hao
1.1	2025-2-11	Add pin description	Hao

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