



# 珠海顶智电子科技有限公司

Zuhai Dingzhi Electronic Technology Co.,LTD

## DXS-S1022\_R88U(FTV)

### Product Specification

**802.11b/g/n USB WIFI Module (1T1R)**  
**(Realtek RTL8188FTV)**

Version Ver1.2

#### History

Document Release	Date	Modification	Initials	Approved
Version V1.2	2018/08/09			



## Overview

The Realtek RTL8188FTV is a highly integrated single-chip 802.11n Wireless LAN (WLAN) network USB interface (USB 1.0/1.1/2.0 compliant) controller. It combines a WLAN MAC, a 1T1R capable WLAN baseband, and WLAN RF in a single chip. The RTL8188FTV provides a complete solution for a high throughput performance integrated wireless LAN device.

The RTL8188FTV WLAN baseband implements Orthogonal Frequency Division Multiplexing (OFDM) with 1 transmit and 1 receive path and is compatible with the IEEE 802.11n specification. Features include one spatial stream transmission, short guard interval (GI) of 400ns, spatial spreading, and transmission over 20MHz and 40MHz bandwidth.

For legacy compatibility, Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying (CCK) and OFDM baseband processing are included to support all IEEE 802.11b and 802.11g data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK with data scrambling capability, are available, and CCK provides support for legacy data rates, with long or short preamble. The high-speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, and 64QAM modulation of the individual subcarriers and rate compatible punctured convolutional coding with coding rate of 1/2, 2/3, 3/4, and 5/6, provide higher data rates of 54Mbps and 150Mbps for IEEE 802.11g and 802.11n OFDM respectively.

The RTL8188FTV WLAN Controller builds in an enhanced signal detector, an adaptive frequency domain equalizer, and a soft-decision Viterbi decoder to alleviate severe multi-path effects and mutual interference in the reception of multiple streams.

Efficient IQ-imbalance, DC offset, phase noise, frequency offset, and timing offset compensations are provided for the radio frequency front-end. Selectable digital transmit and receive FIR filters are provided to meet transmit spectrum mask requirements and to reject adjacent channel interference, respectively.

A-MPDU with BA and A-MSDU, protocol efficiency is significantly improved. Power saving mechanisms such as Legacy Power Save, and U-APSD, reduce the power wasted during idle time, and compensates for the extra power required to transmit OFDM. The RTL8188FTV provides simple legacy and 20MHz/40MHz co-existence mechanisms to ensure backward and network compatibility.

## Features

### General

- CMOS MAC, Baseband PHY, and RF in a single chip for IEEE 802.11b/g/n compatible WLAN
- Complete 802.11n solution for 2.4GHz band
- 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth
- Compatible with 802.11n specification
- Backward compatible with 802.11b/g devices while operating in 802.11n mode



## Interface

- Complies with USB 1.0/1.1/2.0 for WLAN

## Standards Supported

- IEEE 802.11b/g/n compatible WLAN
- IEEE 802.11e QoS Enhancement (WMM)
- 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services

## WLAN MAC Features

1. Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
2. Low latency immediate High-Throughput Block Acknowledgement (HT-BA)
3. PHY-level spoofing to enhance legacy compatibility
4. Power saving mechanism
5. Channel management and co-existence
6. Transmit Opportunity (TXOP) Short Inter-Frame Space (SIFS) bursting for higher multimedia bandwidth

## WLAN PHY Features

- IEEE 802.11n OFDM
- One Transmit and one Receive path (1T1R)
- 20MHz and 40MHz bandwidth transmission
- Short Guard Interval (400ns)
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble
- OFDM with BPSK, QPSK, 16QAM, and 64QAM modulation. Convolutional Coding Rate: 1/2, 2/3, 3/4, and 5/6
- Maximum data rate 54Mbps in 802.11g and 150Mbps in 802.11n
- Selectable receiver FIR filters
- Programmable scaling in transmitter and receiver to trade quantization noise against increased probability of clipping
- Fast receiver Automatic Gain Control (AGC)
- On-chip ADC and DAC

## Applications

Desk-Top PC

Note-book

TV

Blue-ray Disk

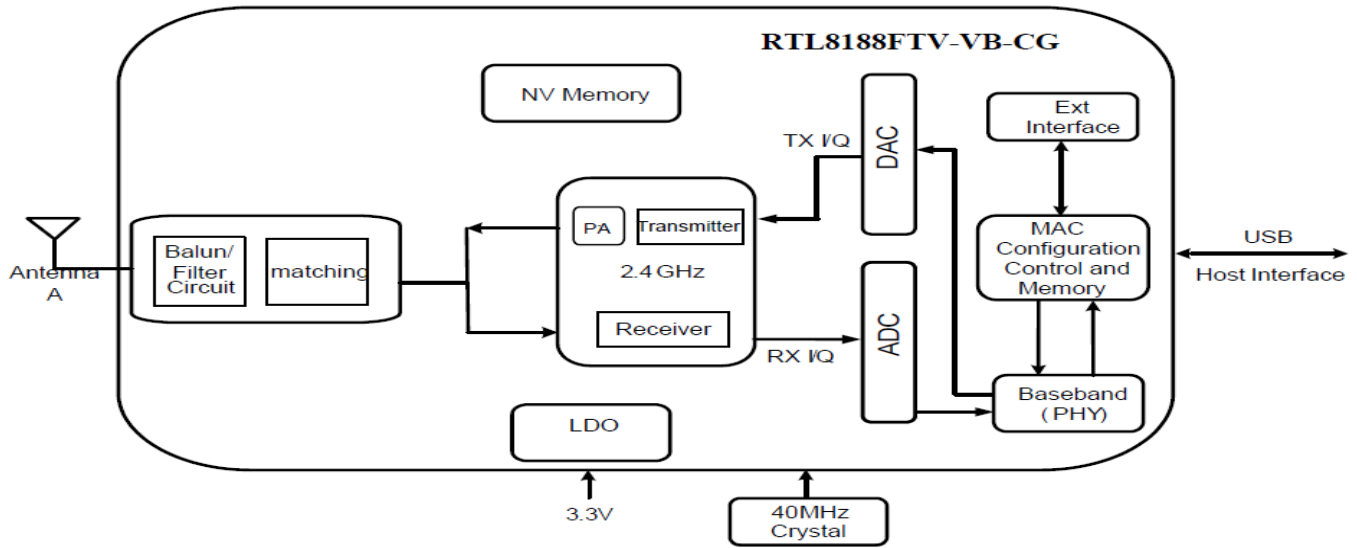
Tablet PC

Set-top box

## DXS-S1022\_R88U(FTV) 订购信息 Order Information

Module name	Part number	Description
DXS-S1022_R88U(FTV)	DXS-S1022_R88U(FTV)-24-NI	RTL8188FTV-VC 支持20M/40M带宽信号, 不带天线扣
DXS-S1022_R88U(FTV)	DXS-S1022_R88U(FTV)-24-WI	RTL8188FTV-VC 支持20M/40M带宽信号, 带天线扣
DXS-S1022_R88U(FTV)	DXS-S1022_R88U(FTV)-20-NI	RTL8188FTV-VQ1 仅支持20M带宽信号, 不带天线扣
DXS-S1022_R88U(FTV)	DXS-S1022_R88U(FTV)-20-WI	RTL8188FTV-VQ1 仅支持20M带宽信号, 带天线扣

## Product block diagram



## General Specification

Model Name	DXS-S1022_R88U(FTV)
Main Chip	RTL8188FTV
Product Name	WLAN 11n USB Module
Standard	802.11b/g/n,
Operation Mode	Ad-hoc , Infrastructure
Data Transfer Rate	1,2,5.5,6,11,12,18,22,24,30,36,48,54,60,90,120 and maximum of 150Mbps
Modulation Method	BPSK/ QPSK/ 16-QAM/ 64-QAM
Frequency Band	2.4GHz ISM Band
Spread Spectrum	IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum) IEEE 802.11g/n:OFDM (Orthogonal Frequency Division Multiplexing)
RF Output Power	802.11b, 19±1dBm,EVM=28dB 802.11g,15±1dBm,EVM=32dB 802.11n20,15±1dBm,EVM=32dB 802.11n40,15±1dBm,EVM=32dB
Receiver Sensitivity	802.11b,11Mbps,-86dBm,PER=8%, 802.11g,54Mbps,-74dBm, PER=10%, 802.11n,20M,65Mbps,-70dBm,PER=10%

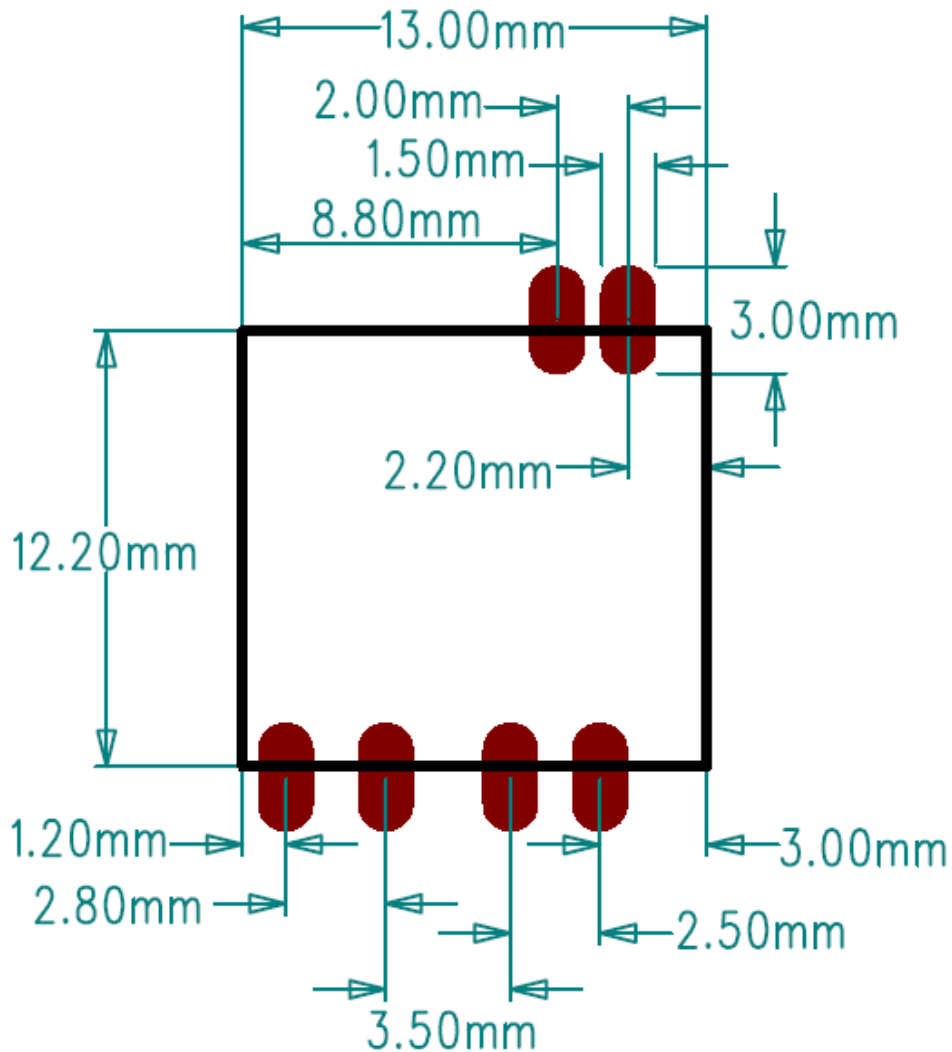


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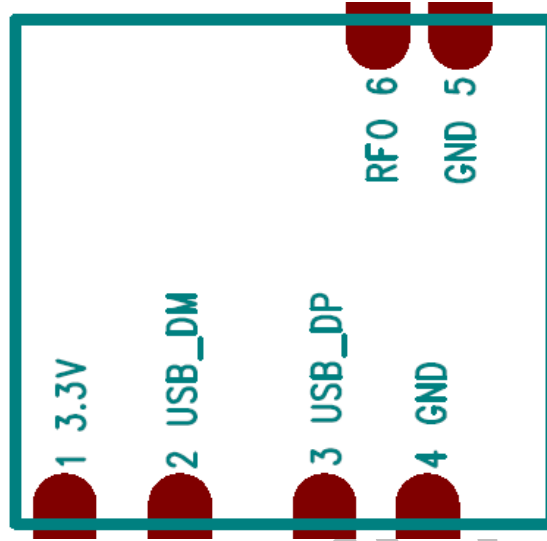
	802.11n,40M,135Mbps,-68dBm, PER=10%
OS Support	Windows XP 32/64, 2000, Windows 7,Vista 32/64 , Linux, Macintosh
Security	WEP, TKIP, AES, WPA, WPA2
Power Consumption	DC 3.3V module - Transmit: max. 260 mA; Receive: max 130 mA
Interface	USB
Ambient Operating Temperature	0 ~ 70° C ambient temperature
Storage Temperature	-55 ~ 125°C ambient temperature
Humidity	5 to 90 % maximum (non-condensing)
PCB Dimension	13 x 12.2 x 0.6mm (LxWxH)

## Dimensions (Units: mm)



## Pin Definition

Pin	Function
1	3.3V
2	USB_DM
3	USB_DP
4	GND
5	GND
6	RFout

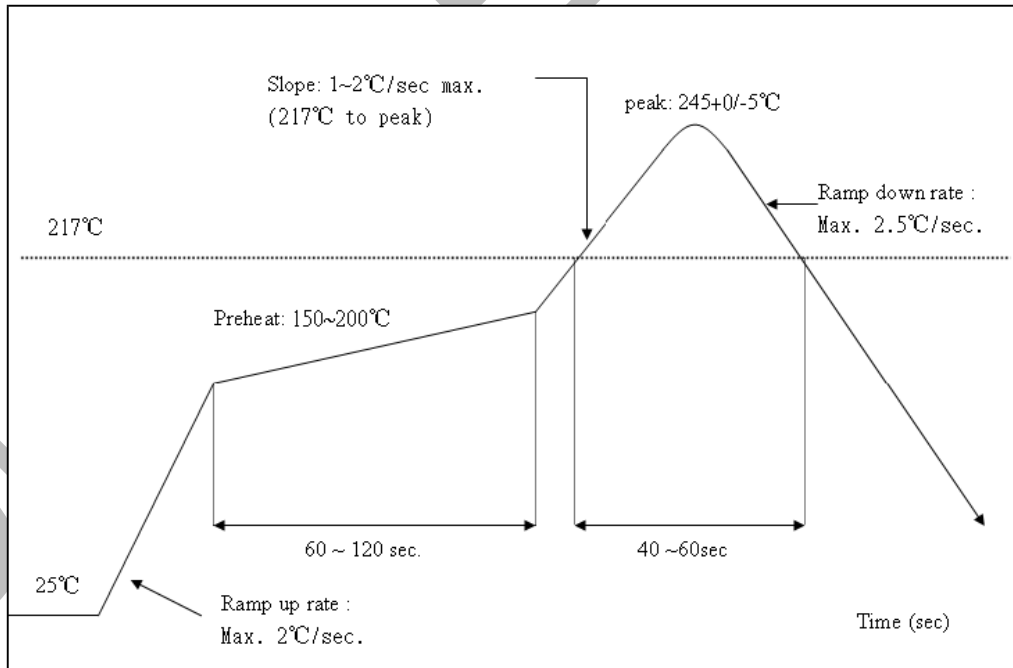


## Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <math><250^{\circ}\text{C}</math>

Number of Times :  $\leq 2$  times



## TEST Characteristics

### 1. TX TEST

#### 1.1 Output Power

**Purpose:** Verify the transmitter output power of the Device Under Test (DUT) is below conformance limit.

**Test Environment:**



**Software:** DUT generates continuous frames to IQview with XXX and measure the output power.

#### 802.11b TX Test

##### 802.11b Data Rate: 11Mbps

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TX Pw (dBm)	19.48	19.50	19.82	20.15	20.32	20.40	20.32	20.45	20.64	20.41	20.28	20.68	20.45	18.55
EVM (dB)	-19.98	-20.15	-19.99	-20.08	-20.12	-20.20	-20.00	-20.19	-20.12	-20.20	-20.25	-20.16	-20.05	-22.07
Freq.Offset (KHz)	-4.22	-4.28	-4.35	-4.32	-4.32	-4.37	-4.32	-4.30	-4.35	-4.28	-4.23	-4.27	-4.23	-4.17

**Criterion:** TX Power > 17dBm, EVM < -18dB, Frequency Offset <  $\pm 25$ ppm, Mask < -30dBc,

#### 802.11g TX Test

##### 802.11g Data Rate: 54Mbps

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TX Pw (dBm)	14.90	15.07	15.72	16.17	16.41	16.48	16.53	16.69	16.89	16.64	16.58	17.04	16.66	15.97
EVM (dB)	-31.29	-31.15	-30.28	-29.95	-29.57	-29.24	-29.27	-29.30	-29.46	-29.73	-30.09	-29.72	-30.09	-30.79
Freq.Offset (KHz)	-4.22	-4.22	-4.22	-4.23	-4.23	-4.22	-4.20	-4.20	-4.23	-4.22	-4.20	-4.22	-4.22	-4.23

**Criterion:** TX Power > 14dBm, EVM < -25dB, Frequency Offset <  $\pm 20$ ppm, Mask < -30dBc,



## 802.11n(20) TX Test

802.11n Data Rate:MCS7 20M														
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TX Pw (dBm)	14.89	15.07	15.59	16.11	16.34	16.36	16.47	16.60	16.73	16.57	16.30	16.77	16.46	15.74
EVM (dB)	-31.31	-31.47	-30.84	-30.01	-29.13	-29.87	-29.40	-29.71	-29.52	-30.01	-29.91	-29.30	-29.70	-30.73
Freq.Offset (KHz)	-4.22	-4.23	-4.25	-4.25	-4.25	-4.25	-4.27	-4.27	-4.27	-4.30	-4.28	-4.28	-4.27	-4.28

**Criterion:** TX Power > 13dBm, EVM < -28dB, Frequency Offset < ±20ppm, Mask < -30dBc,

## 802.11n(40M) TX Test

802.11n Data Rate:MCS7 40M														
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TX Pw (dBm)			15.18	15.48	15.67	15.72	15.75	15.77	16.11	15.91	15.83			
EVM (dB)			-31.95	-31.74	-31.50	-31.65	-31.25	-31.24	-30.65	-31.20	-31.73			
Freq.Offset (KHz)			-4.23	-4.22	-4.20	-4.22	-4.23	-4.20	-4.20	-4.20	-4.22			

**Criterion:** TX Power > 13dBm, EVM < -28dB, Frequency Offset < ±25ppm, Mask < -25dBc,

## 2. RX TEST

### 802.11b RX Test

802.11b Data Rate: 11Mbps														
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sensitivity (dBm)	-86	-86	-86	-86	-86	-86	-86	-86	-86	-86	-86	-86	-86	-86

**Criterion:** PER (11b,11Mbps)@8% , Sensitivity < -76dBm

### 802.11g RX Test

802.11g Data Rate: 54Mbps														
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sensitivity (dBm)	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74

**Criterion:** PER (11g,54Mbps)@10% , Sensitivity < -65dBm

### 802.11n(20M)RX Test

802.11n Data Rate: MCS7 20M														
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sensitivity (dBm)	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70

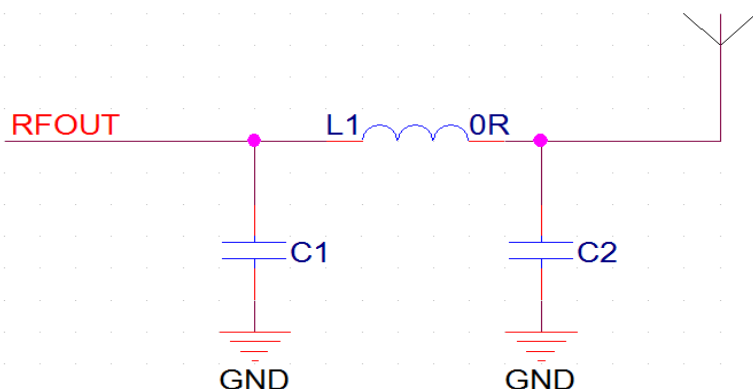
**Criterion:** PER (11n,HT20,MCS7)@10% , Sensitivity < -64dBm



## 802.11n(40M)RX Test

802.11n Data Rate: MCS7 40M														
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sensitivity (dBm)			-68	-68	-68	-68	-68	-68	-68	-68	-68			
<b>Criterion:</b> PER (11n,HT40,MCS7)@10% , Sensitivity <-61dBm														

## External antenna reference design



设计天线匹配网络距离模块不要超过5mm，走线控制50欧姆阻抗且需预留 $\pi$ 型天线匹配网络。  
**PCB布局时模块应尽量远离干扰源。**

## FCC WARNING

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.

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

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.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.



## Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

### 2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209

### 2.3 Specific operational use conditions

Not applicable. The module is a normal 2.4G module, which has its own antenna connector and specific antenna, and it is not a point-to-point device, not 5G WIFI device;

### 2.4 Limited module procedures

The module does not have a shield. It must be connected to the host for use. The distance between the antenna and end user must be min20cm. It can guarantee the RF Exp requirements. For additional hosts other than the specific host originally granted with a limited module, a Class II Permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

### 2.5 Trace antenna designs

Not applicable. The module has a unique antenna connector and has its own FPC antenna (antenna gain: 1dBi).

### 2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm (mobile/fixed device) is maintained between the antenna and users' body; 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 host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### 2.7 Antennas

Type: FPC Antenna; Gain: 1 dBi; It is not free to move. It requires a professional to disassemble or install the antenna. This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

### 2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2ATZK-DZ" with their finished product.

### 2.9 Information on test modes and additional testing requirements

Operation frequency: 802.11b/g/n20:2412~2462 MHz; 802.11n40:2422~2452 MHz;

Modulation type: IEEE 802.11b : DSSS (DBPSK, DQPSK, CCK) IEEE 802.11g/n (HT20/HT40) : OFDM (64QAM, 16QAM, QPSK, BPSK);

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.



## 2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

### IMPORTANT NOTES

#### Co-location warning:

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

#### OEM integration instructions:

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

#### Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

#### End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2ATZK-DZ".

#### Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.