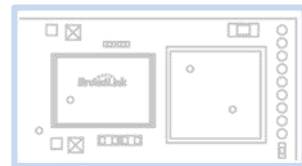




BiTrend™ EssentialSeriesWi-Fi Module Datasheet



BL3328-P

Hangzhou Gubei Electronics Technology Co., Ltd.

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Version History

V 1.0.0	22/01/2016	1 st issue of preliminary document
V1.1.0	2/06/2017	Add some performance parameters
V1.2.0	9/06/2017	Correction of RF parameters and The module packaging size

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1. Introduction

1.1 Overview

BiTrend™ Essential is the industrial leading 2.4GHz 802.11 b/g/n embedded Wi-Fi module which delivers unmatched performance and codeless development in a compact package, providing a quick, easy and cost effective way for developers and manufacturers to add Wi-Fi connectivity for home automation, lighting control, energy efficiency and other IOT applications.

BiTrend™ Essential family combines a 2.4GHz 802.11 b/g/n radio transceiver with a 32-bit microprocessor and embedded with MAC, baseband processing and optimized Wi-Fi network stack. It is an ideal solution for developers and manufacturers with limited RF and embedded programming expertise as it significantly reduces RF design time and removes the burden of testing and certification.

Benefitted from BroadLink's turn-key solution, BiTrend™ Essential is an ideal solution for developers with limited Wi-Fi or RF expertise or for those seeking faster time to market. It reduces RF design time and removes the burden of testing and certification. BiTrend™ Essential is fully compliant with IEEE 802.11 b/g/n standard and certified with CE, FCC and RoHS.

BiTrend™ Essential is a highly integrated Wi-Fi SoC(system on Chip) single chip, which supports IEEE 802.11b/g/n single stream, providing GPIO for intelligent control, and UART interfaces for device communication.

BiTrend™ Essential has 8Mbits flash and integrates power amplifier, low noise amplifier, and RF switch to reduce the module size and RF design capability required. And also integrate power manage unit for single 3.3V power source for cost effective design.

BiTrend™ Essential embedded 32-bit RISC MCU for 802.11b/g/n drivers, supplicant, TCP/IP protocol stack, and networking applications, can be operated in station mode and softAP mode. The 3328-P is an ideal solution for embedded device to enable networking service with minimized design effort.

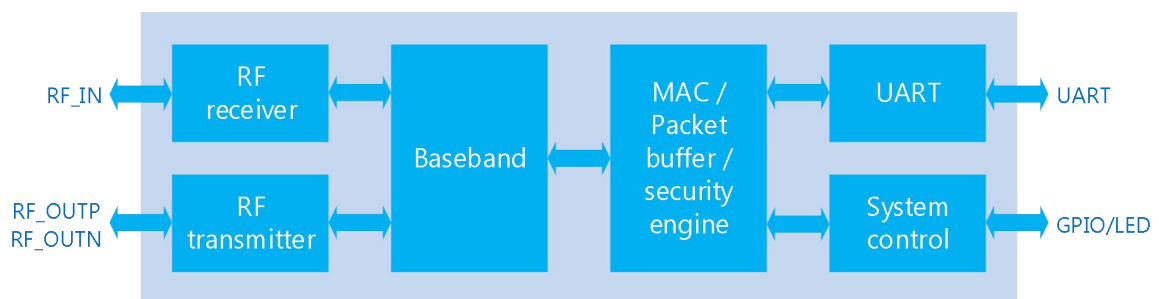


Figure 1. 3328-P block diagram

1.2 Applications

- Smart home appliances
- Remote Control
- Medical/Health Care
- Network consumer devices

1.3 Key Features

- a. Support IEEE802.11b/g/n

Frequency Range	2.412 GHz - 2.484 GHz
Wi-Fi Standard	IEEE 802.11 b/g/n
Transmitter Power	802.11b:18dBm 802.11g:16dBm 802.11n:15dBm
MIN Receiver Sensitivity	802.11b<-82dBm@11Mbps 802.11g<-72dBm@54Mbps 802.11n<-71dBm@MCS7
Data rate	11M@802.11b, 54M@802.11g, MCS7@802.11n
Security	Encryption Standard: WEP/WEPA/WPA2 EncryptionAlgorithm: WEP64/WEPA128/TKIP/AES
Wi-Fi Modes	STA/AP/STA+AP/WIFI Direct

- b. Support **UART\PWM\ADC\GPIO\I2C** port
- c. Support **STA\AP\AP+STA**
- d. Patent Smart Config™ technology
- e. Support **TLS\SSL\mDNS**
- f. PCB printed antenna

Antenna type	PCB printed ANT
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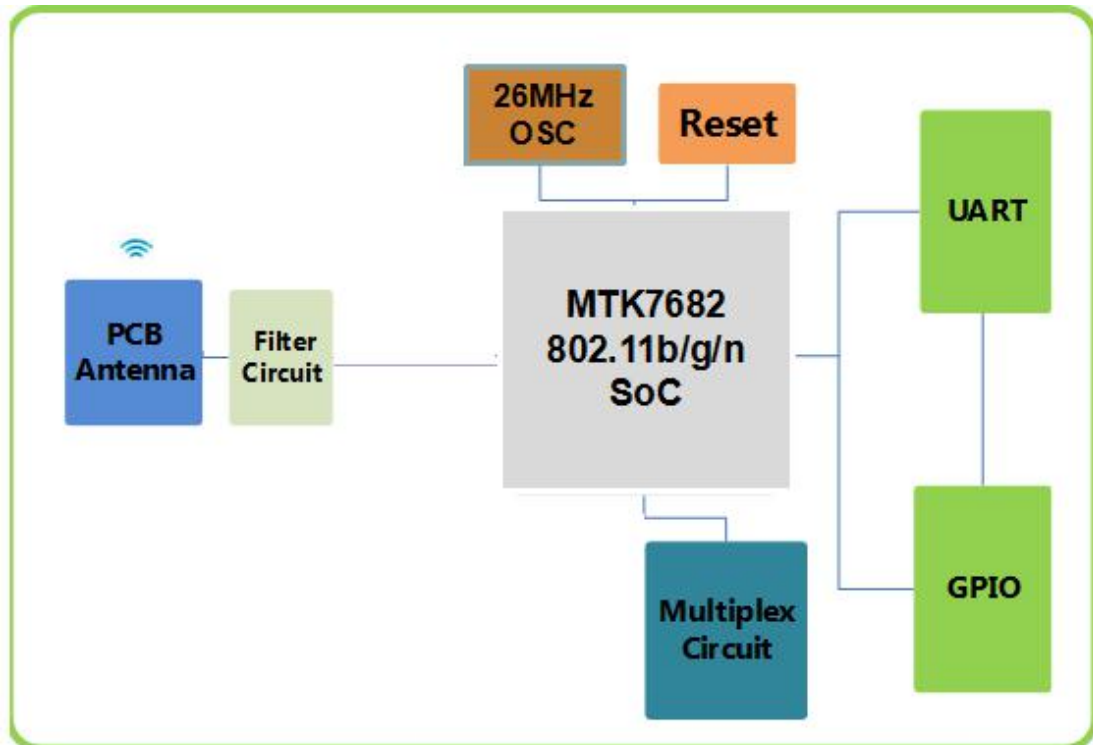
- g. Power source: 3.3V
- h. Dimension (L*W*H) : 31mm*17.7mm*3.6mm (Including shielding cover height)
- i. ESD: 2KV

2. Product Overview

2.1 Product Picture



2.2 Block Diagram



3. Electrical Characteristics

3.1 Absolute Maximum Ratings – Voltage & Current

Using products above the absolute maximum ratings may cause permanent damage to the device. These are maximum ratings only and functional operation of the device at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect the reliability of the device.

Symbol	Description	Min.	Max.	Units
T _s	Storage temperature	-40	125	°C
T _{AMBIENT}	Ambient Temperature	-10	80	°C
V _{dd}	Supply voltage	3.0	3.6	V
V _{io}	Voltage on IO pin	0	3.3	V
V _{ESD}	HBM(human body model)		2000	V

3.2 Current consumption

Symbol	Condition	Performance	
		TYP	Unit
I _{RF_Standby} (SP mini)	IDLE mode	46	mA
I _{RF_b}	pulse current @TX 11b @18dBm 11Mbps	265	mA
I _{RF_g}	pulse current @TX 11g @16dBm 54Mbps	216	mA
I _{RF_n}	pulse current @TX 11n @15dBm MCS7	212	mA

Note: All result is measured at the antenna port and VDD33 is 3.3V

3.3 Absolute maximum ratings – Temperature

Symbol	Rati	Max	Unit
T _{STG}	Storagetemperature	-40 to+125	°C
T _A	Workingtemperature	-10 to+80	°C

Humidity	Non condensing, relative humidity	90% (RH)	
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3.4 Absolute maximum ratings – ESD

Symbol	Ratings	Conditions	Class	Max	Unit
V _{ESD} (HBM)	Electrostatic discharge voltage (human body model)	TA = +25 °C conforming to JESD22-A114	2	2000	V

4. RF Characteristics

4.1 Basic Characteristics

Item	Specification
Operating Frequency	2.412 GHz - 2.484 GHz
Wi-Fi Standard	IEEE 802.11b/g/n
Modulation Type	11b: DBPSK, DQPSK, CCK for DSSS 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0~7, OFDM
Data Rates	11b: 1, 2, 5.5 and 11 Mbps 11g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~7, up to 150 Mbps
Antenna type	PCB printed ANT

4.2 IEEE802.11b Mode

Item	Specification
Modulation Type	DSSS/CCK
Frequency range	2412 MHz ~ 2484 MHz
Channel	CH1 to CH14
Data rate	1, 2, 5.5, 11 Mbps

TX Characteristics	Min	Typical	Max.	Unit
Transmitter Output Power				

@11Mbps		18		dBm
Frequency Error	-10		+10	ppm
Constellation Error(peak EVM)@ target power				
@11Mbps			-37	
Transmit spectrum mask				
Pass				

RX Characteristics	Min	Typical	Max.	Unit
Minimum Input Level Sensitivity				
11Mbps (FER \leq 8%)			-83	dBm
Maximum Input Level (FER \leq 8%)	-10			dBm

4.3 IEEE802.11g Mode

Item	Specification
ModulationType	OFDM
Frequencyrange	2412MHz~2484MHz
Channel	CH1 toCH14
Datarate	6,9,12,18,24,36,48,54Mbps

TX Characteristics	Min	Typical	Max.	Unit
Transmitter Output Power				
@54Mbps		16		dBm
Frequency Error	-10		+10	ppm
Constellation Error(peak EVM)@ target power				
@54Mbps			-32	dB
Transmit spectrum mask				
Pass				

RX Characteristics	Min	Typical	Max.	Unit
Minimum Input Level Sensitivity				
@54Mbps		-71.5		dBm
Maximum Input Level (FER \leq 10%)	-10			dBm

4.4 IEEE802.11n 20Mhz Bandwidth Mode

Item	Specification
ModulationType	OFDM
Frequencyrange	2412MHz~2484MHz
Channel	CH1 toCH14
Datarate	MCS0/1/2/3/4/5/6/7

TX Characteristics	Min	Typical	Max.	Unit
Transmitter Output Power				
@HT20, MCS7		15		dBm
Frequency Error	-10		+10	ppm
Constellation Error(peak EVM)@ target power				
@HT20, MCS7			-33	dB
Transmit spectrum mask				
Pass				
RX Characteristics	Min	Typical	Max.	Unit
Minimum Input Level Sensitivity				
@HT20, MCS7		-71		dBm
Maximum Input Level (FER \leq 10%)	-20			dBm

4.5 IEEE802.11n 40Mhz Bandwidth Mode

Item	Specification
ModulationType	OFDM
Frequencyrange	2412MHz~2484MHz
Channel	CH1 toCH14
Datarate	MCS0/1/2/3/4/5/6/7

TX Characteristics	Min	Typical	Max.	Unit
Transmitter Output Power				
@HT40, MCS7		14.5		dBm
Frequency Error	-10		+10	ppm

Constellation Error(peak EVM)@ target power				
@HT40, MCS7			-33	dB
Transmit spectrum mask				
Pass				
RX Characteristics	Min	Typical	Max.	Unit
Minimum Input Level Sensitivity				
@HT40, MCS7		-69		dBm
Maximum Input Level (FER \leq 10%)	-20			dBm

5. Mechanical Characteristics



Figure2. 3328-P top view(Metricunits)

6. Module Interfaces

6.1 PIN Layout

3328-P has one group of pins 2X9. The layout of PINs are shown in the figure below.

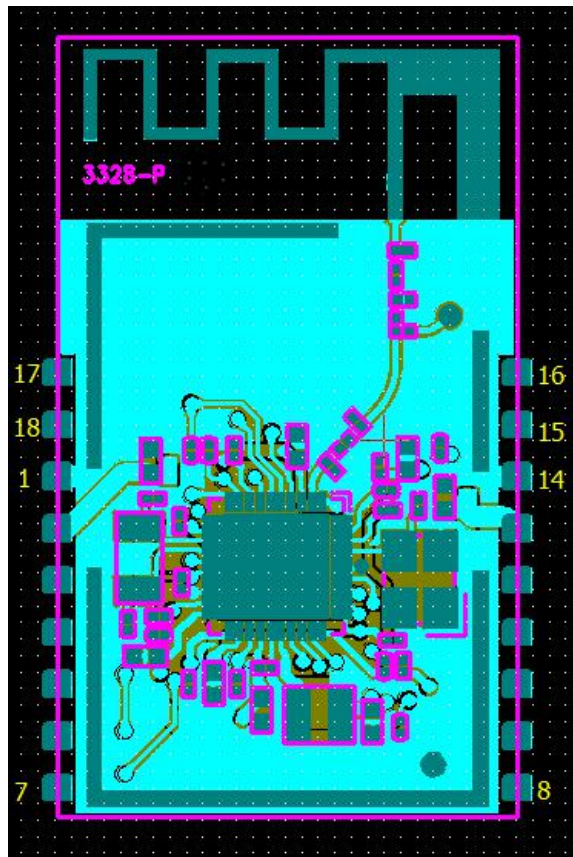


Figure6. 3328-P Layout

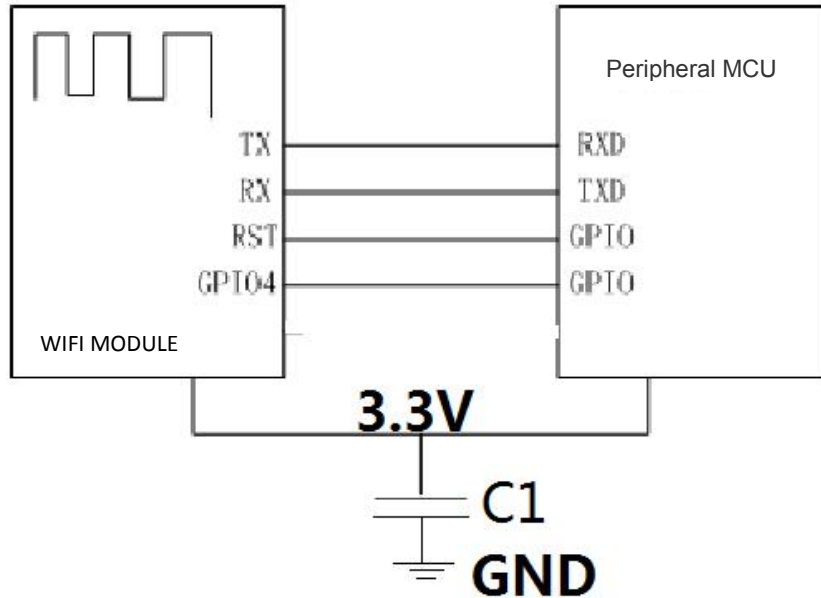
6.2 PIN Definitions

PIN Assignment

PIN	PIN NAME	NOTE
Pin1	GND	
Pin2	VCC	3.3V
Pin3	RST_N	Module software reset, Available at low level

Pin4	UART_TX	UART Only for Passthrough
	GPIO22	I/O
Pin5	UART_RX	UART Only for Passthrough
	GPIO21	I/O
Pin6	TX2	UART Only for Passthrough
	GPIO12	I/O
	I2S_TX	I2S Port
Pin7	RX2	UART Only for Passthrough
	GPIO11	I/O
	I2S_RX	I2S Port
Pin8	RTC_EINT	Wake up only for module RTC mode
Pin9	GPIO4	I/O
	I2S_MCLK	I2S Port
Pin10	GPIO3	I/O
	TX1	UART Only for Passthrough
	I2S_CK	I2S Port
Pin11	GPIO2	I/O
	RX1	UART Only for Passthrough
Pin12	GPIO13	I/O
	I2S_WS	I2S Port
Pin13	VCC	3.3V
Pin14	GND	
Pin15	GPIO14	I/O
Pin16	GPIO17	I/O
	AUXADC0	
Pin17	I2C1_SCL	I2CPort
	GPIO15	I/O
Pin18	I2C1_SDA	I2C Port
	GPIO16	I/O

7. Reference Design



If the peripheral MCU uses power source of 5V, it needs to add a level switching circuit in the connection of the serial port and the related circuit.

The module needs a large current about 300mA when transmitting data, please ensure that the power source can provide sufficient current.

8. AntennaCharacteristics

8.1 Antenna Selection

The WT1SBSL supports on-board PCB printed antenna. When the Operating Frequency is between 2.4G~2.5GHz, S11 of antenna port is less than -10dB and peak gain is about 1.5dBi.

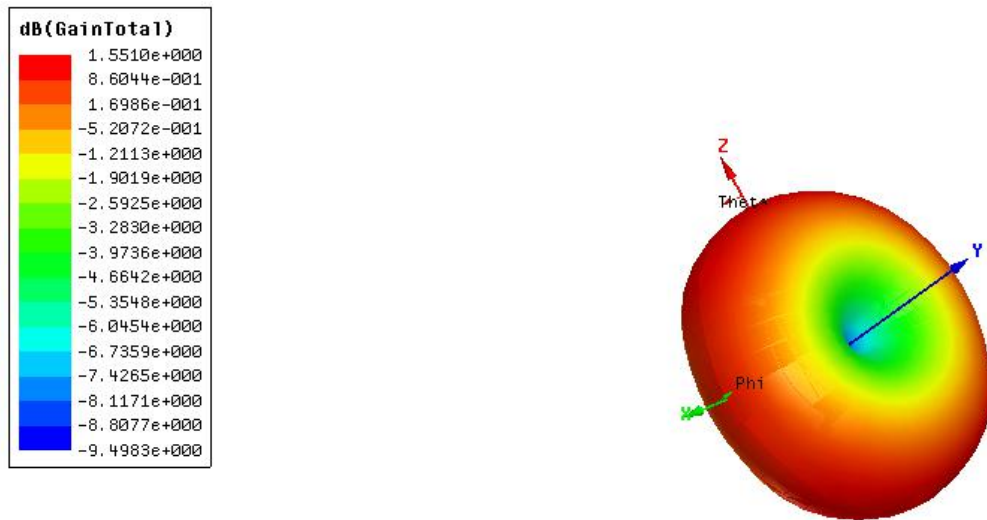


Figure 7. Antenna radiation pattern simulation

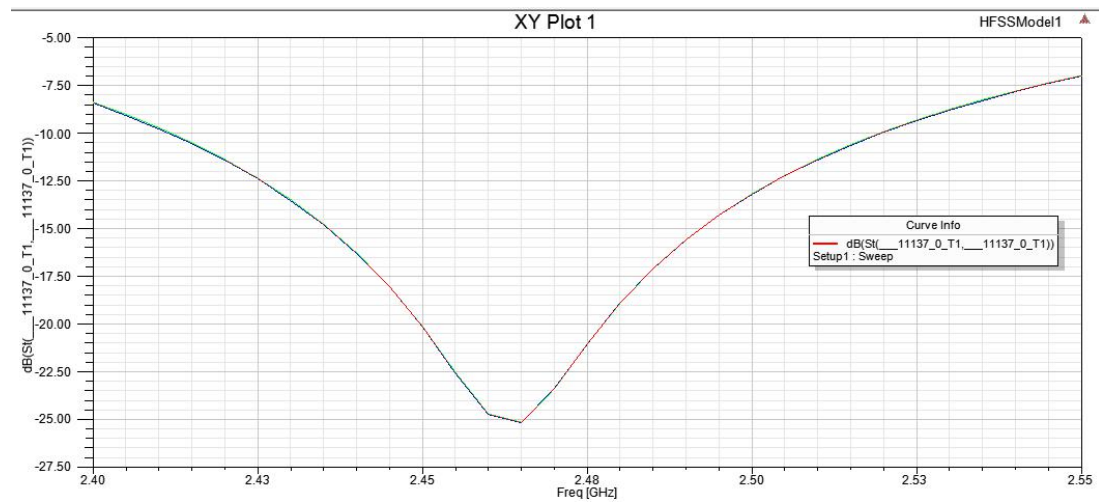


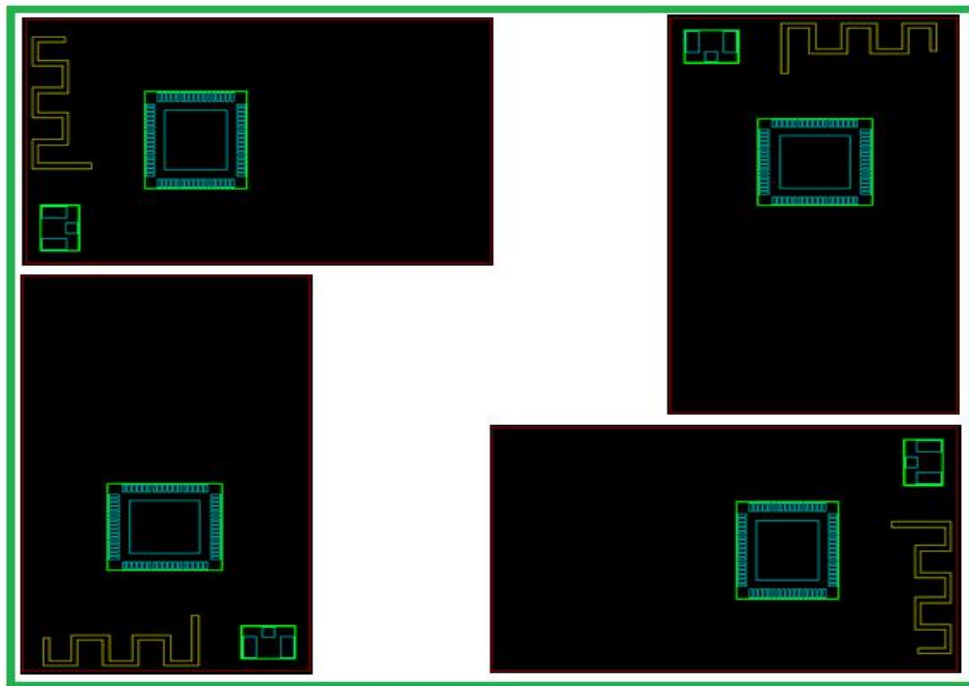
Figure 8. Antenna port S11simulation curve

In practical use, 3328-P is welded on user's board and value of S11 has some changes.

8.2 Minimizing Radio Interference

When integrating the Wi-Fi module with on board PCB printed antenna, make sure the three points below:

1. The area under the antenna end of the module should be keep clear of metallic components, connectors, vias, traces and other materials that can interfere with the radio signal.
2. The area around the antenna end the module protrudes at least 10mm from the mother board PCB and any metal enclosure.
3. When planning PCB layout, it is recommended that user places the antenna of Wi-Fi module as close as possible to the edge of boarder to ensure the good performance of antenna, which is shown in the picture below.



8.3 Specification of On-Board Antenna

OperatingFrequency	2.4G~2.5GHz
VSWR(max)	2
Peak Gain	1.5dBi
AntennaType	PIFA

Appendix A Glossary (Quentin respible)

ADC	Analog-to -Digital Converter
AES	Advanced Encryption Standard
ANT	Antenna
AP	Wireless Access Point
BPSK	Binary Phase Shift Keying
DBPSK	Differential binary phase shift keying
DC	Direct Current
CCK	Complementary Code Keying
CDM	Charge Device Model
DHCP	Dynamic Host Configuration Protocol
CMOS	Complementary Metal Oxide Semiconductor
DNS	Determination of non-significance
DQPSK	Differential quadrature phase shift keying
DSSS	Demand assigned signaling and switching subsystem
DTIM	Digital Transmission Interface Module
EMSP	Enhanced Modular Signal Processor
ESD	Electrostatic Discharge
EVM	Error Vector Magnitude
FCC	Federal Communications Commission
FER	Floating Error
GND	Ground
GPIO	General Purpose Input/Output
HBM	Human body model
IEEE	Institute of Electrical and Electronics Engineers
IO	Input/Output
IOT	Individual operation test
IPv4	Internet Protocol version 4
LED	Light-emitting diode
LVTTTL	Low Voltage Transistor Transistor Logic
MAC	Medium Access Control layer
MCS	Modulation and coding scheme
MCU	Microcontroller Unit
MIMO	Multiple-Input Multiple-Output
MSL	Multilayer Switching Protocol
NC	Numerical Control
NRST	Negative Reset
OFDM	Orthogonal Frequency Division Multiplexing
OSC	Oscillator
PCB	Printed Circuit Board
PIFA	Planar inverted F antenna
QPSK	Quadrature Phase Shift Keyin

RC	Resistance- capacitance
RF	Radio Frequency
RISC	Reduced Instruction Set Computer
RoHS	Restriction of Hazardous Substances
RX	Receiver
SDIO	Serial Digital Input/Output
SoC	System on Chip
SPDT	Single-Pole Double-Throw
SPI	Serial Peripheral Interface
STA	Spanning Tree Algorithm
TCP	Transfer Control Protocol
TKIP	Temporal Key Integrity Protocol
TX	Transmitter
IP	Internet Protocol
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
UFL	a miniature coaxial RF connector for high-frequency signals manufactured by Hirose Electric Group
VSWR	Voltage Standing Wave Ratio
WEP	Wired Equivalent Privacy
WEPA	Welded Electronic Packaging Association
WEP64	64 bit Wired Equivalent Privacy
WEP128	128 bit Wired Equivalent Privacy
WPA2	Wi-Fi Protected Access 2
XTAL	External Crystal Oscillator
QAM	Quadrature Amplitude Modulation
802.11 b/g/n	The IEEE 802.11 b/g/n

Appendix B Reference paper (Quentin respible)

[1] IEEE 802.11b/g/n- published IEEE 802.11-2007 wireless networking standard and published IEEE 802.11-2012 standard for Information technology - Clause 19 of the published IEEE 802.11-2007 standard, and Clause 19 of the published IEEE 802.11-2012 standard.

Contact Us



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This device complies with Part 15 of the FCC Rules / Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

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.

MPE Requirements

To satisfy FCC / IC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.

Les antennes installées doivent être situées de façon à ce que la population ne puisse y être exposée à une distance de moins de 20 cm. Installer les antennes de façon à ce que le personnel ne puisse approcher à 20 cm ou moins de la position centrale de l'antenne.

La FCC des états-unis stipule que cet appareil doit être en tout temps éloigné d' au moins 20 cm des personnes pendant son fonctionnement.

Region Selection

Limited by local law regulations, version for North America does not have region selection option.

Information for the OEM Integrators

This device is intended for OEM integrators only. Please see the full grant of equipment document for restrictions.

Label Information to the End User by the OEM or Integrators

If the FCC ID of this module is not visible when it is installed inside another device, then the outside of the device into which the module is installed must be label with “Contains FCC ID: XXXXXXX and IC: XXXXXXX”