BroadLink

BiTrend™ EssentialSeriesWi-Fi Module
User Manual

WT1SBSL

Hangzhou Gubei Electronics Technology Co., Ltd.

Copyright Information

Version History

V 1.0.0   22/01/2016   1stissue of preliminary document

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1. Introduction

1.1 Overview

BiTrend™ Essentialis 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 supportsIEEE802.11b/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 WT1SBSL is an ideal solution for embedded device to enable networking service with minimized design effort.
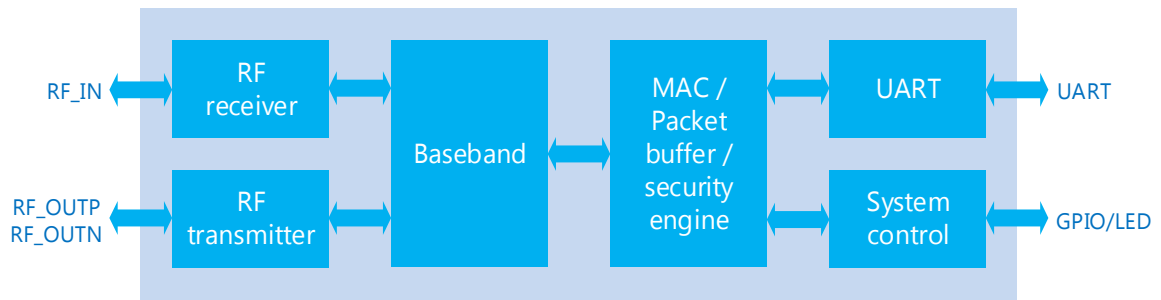
Figure 1. WT1SBSL block diagram

1.2 Applications

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

1.3 Key Features

a. Support IEEE802.11b/g/n
b. Support UARTtransparent transfer
c. Support STA\AP
d. Patent SmartConfig™ technology
e. Support IPv4, TCP/UDP/ DNS/DHCP
f. PCB printed antenna
g. Power source: 3.3V
h. Peripherals:
    1*UART
    5*GPIO
    1*RESET
i. Dimension 31mm*17.7mm*3.6mm
j. ESD: 2KV
k. Absolute maximum ratings

www.ibroadlink.com

2. Product Overview

2.1 Product Picture

2.2 Block Diagram
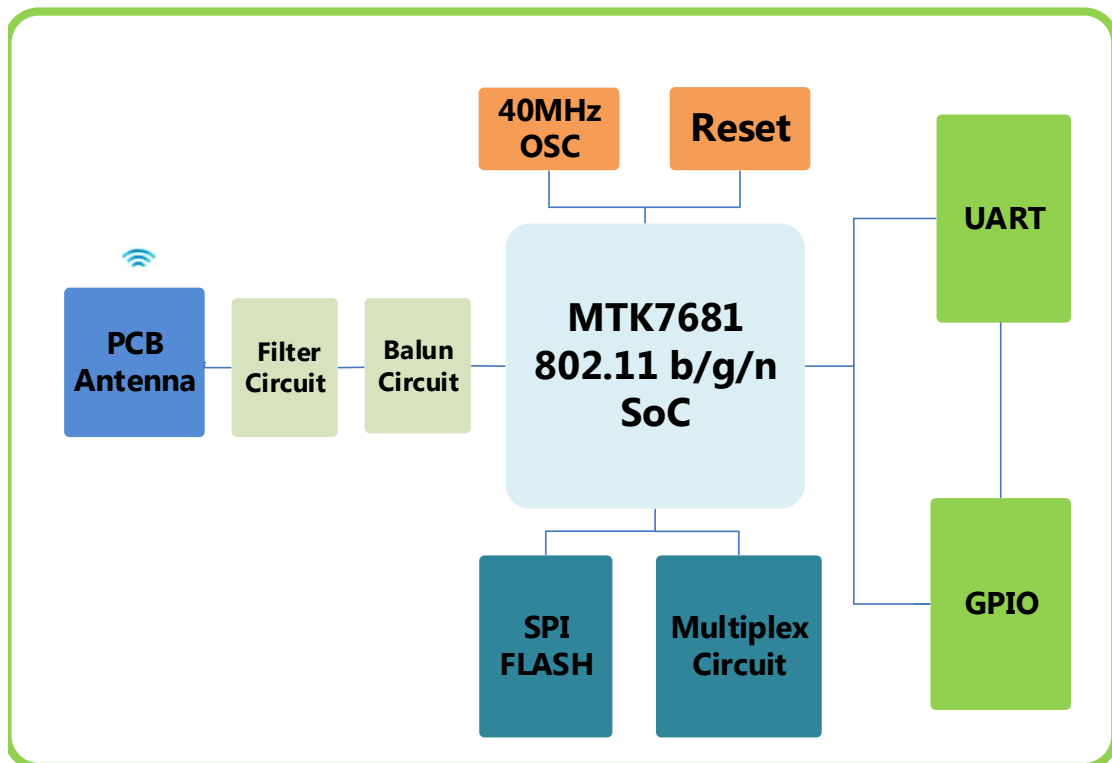
3. Electrical Characteristics

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 a ect the reliability of the device.

| Symbol	Rating	MIN	TYP	MAX	Unit
VDD33	3.3V Supply Voltage	2.97	3.3	3.63	V

Symbol	Ratings	Max	Unit
I_{VDD}	Total current into VDD power lines (source)	90	
I_{VSS}	Total current out of VSS ground lines (sink)	90	mA
I_{IO}	Output current sunk by any I/O and control pin	10	
	Output current source by any I/Os and control pin	10	

3.2 Current consumption

Symbol	Condition	Performance	
		TYP	Unit
I_{RF}	IDLE mode	80	mA
I_{RF}	RX Active, HT40, MCS7	151	mA
I_{RF}	TX HT40, MCS7 @ 15dBm（pulse）	210	mA
I_{RF}	TX CCK 11Mbps @ 18dBm（pulse）	250	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	℃
T_A	Workingtemperature	-10 to+70	℃
Humidity	Non condensing, relative humidity	90%（RH）	

3.4Absolute 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. Module Interfaces

4.1 PIN Layout

WT1SBSL has one group of pins2X7. The layout of PINs are shown in the figure below.
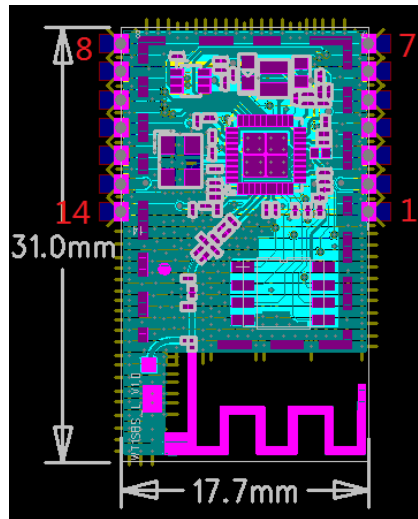
Figure6.WT1SBSLpin-out

4.2 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
Pin5	UART_RX	for Passthrough
Pin6	GPIO3	
Pin7	GPIO4	Feed watchdog
Pin8	GPIO4	Feed watchdog
Pin9	GPIO3	
Pin10	GPIO2	

Pin11	GPIO1	Module software reset, Available at High level
Pin12	GPIO0	Usually use as Wi-Fi LED
Pin13	VCC	3.3V
Pin14	GND	

5. Reference Design
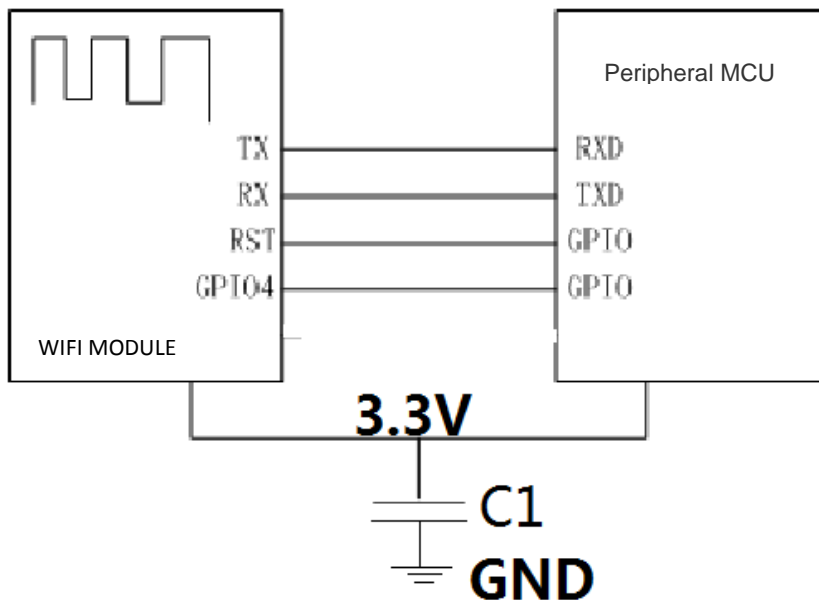
In addition to the standard serial port，the peripheral MCU also need to provide two GPIO pins to connect with the GPIO4 pin and the RST pin of the WIFI module respectively,when the WIFI module works properly,the GPIO4 pin will keep outputting message of dog feeding,if the peripheral MCU did not receive the message,the module will reset and restart through pulling down the RST pin by the other GPIO pin.

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 250mA when transmitting data,please ensure that the power source can provide sufficient current.

6. AntennaCharacteristics

6.1 Antenna Selection

The WT1SBSL supports on-board PCB printed antenna.When the Operating Frequencyis between 2.4G~2.5GHz, S11 of antenna port is less than-10dB and peak gainis about 1. 5dBi.
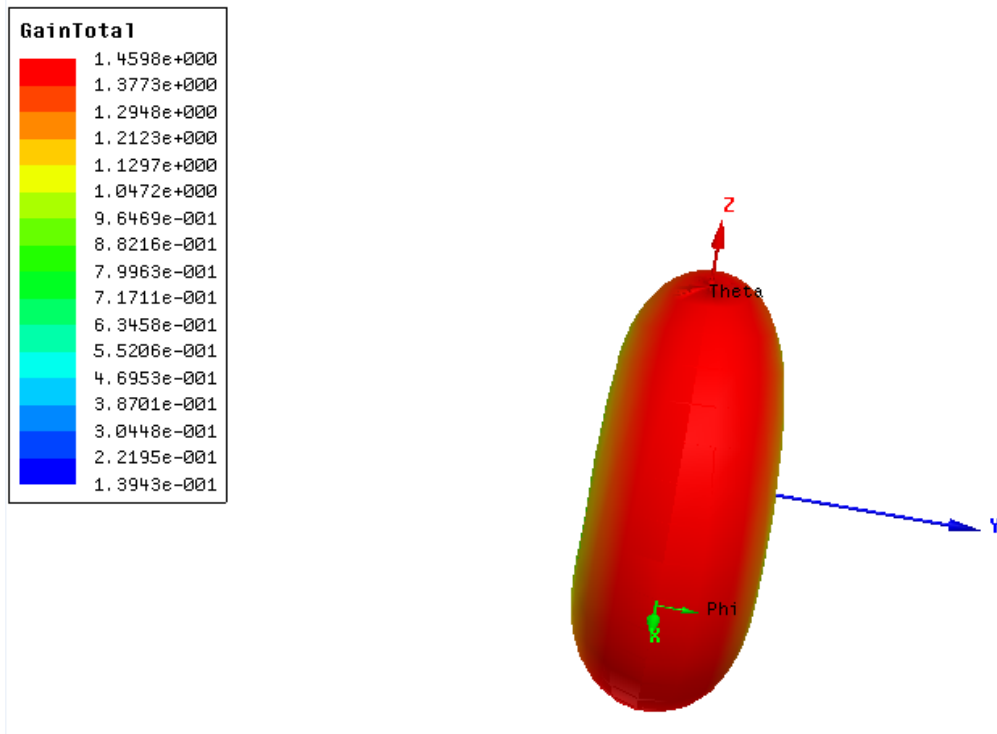

Figure 7. Antenna radiation pattern simulation
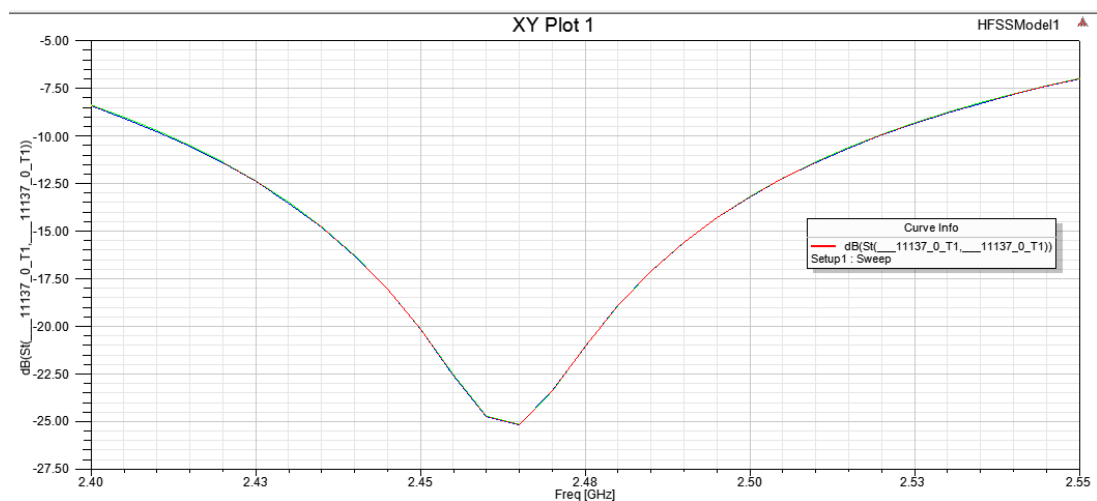
Figure 8. Antenna port S11simulation curve

In practical use, WT1SBSL is welded on user's boardand value of S11 has some changes.

6.2 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.
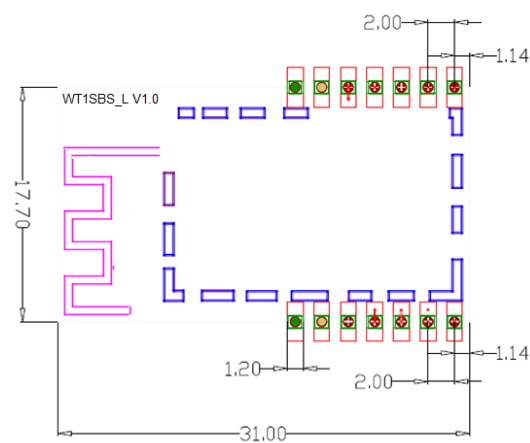
3. When planning PCB layout, it is recommended that user places the antenna of Wi-Fi module as close as possible to the edge of boarder to ensure the good performance of antenna, which is shown in the picture below.
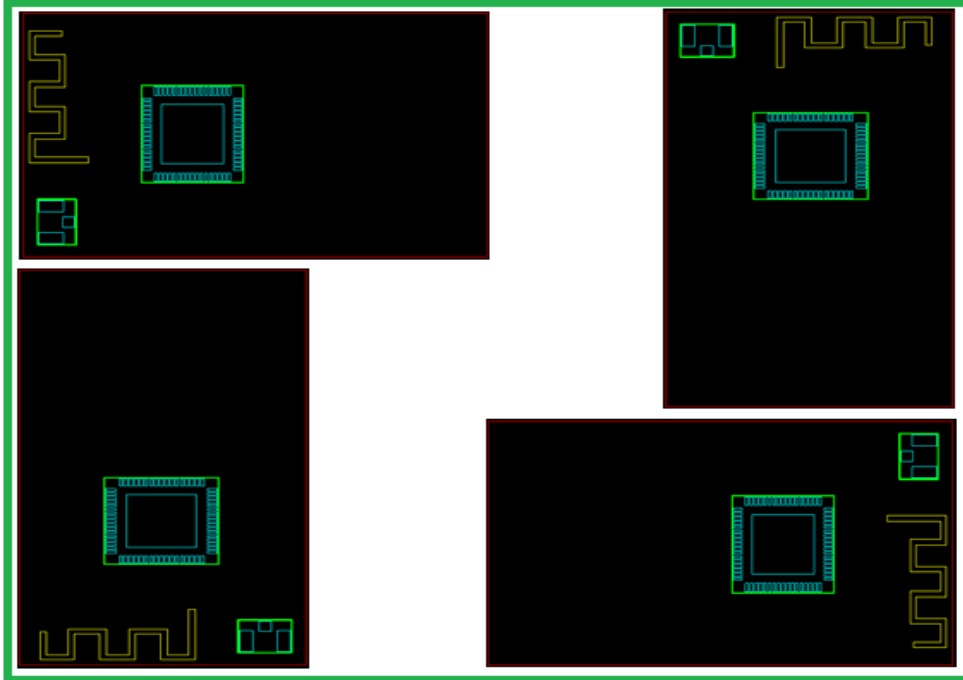
6.3 Specification of On-Board Antenna

OperatingFrequency	2.4G~2.5GHz
VSWR(max)	2
Peak Gain	1.45dBi
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
LVTTL	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 802.11-2007wireless networking standard and published IEEE 802.11-2012 standard for Information technology - Clause 19 of the publishedIEEE 802.11-2007 standard, and Clause 19 of the published IEEE 802.11-2012 standard.

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          W     M     1     P     B     S
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Category
W=WIFI MODULE

Chip manufacturer
M=Marvell
T =MTK

Series
M1=88W8782
M2=88W8801
T1 =MT7681

Package
S=SMD
P=PIM
D=DIP
F=CF
H=Header

Antenna
B=PCB Antenna
U=U.FL Jack
H=Helical Antenna

Shielding Case
S=With Shielding Case
Empty=Without Shielding Case
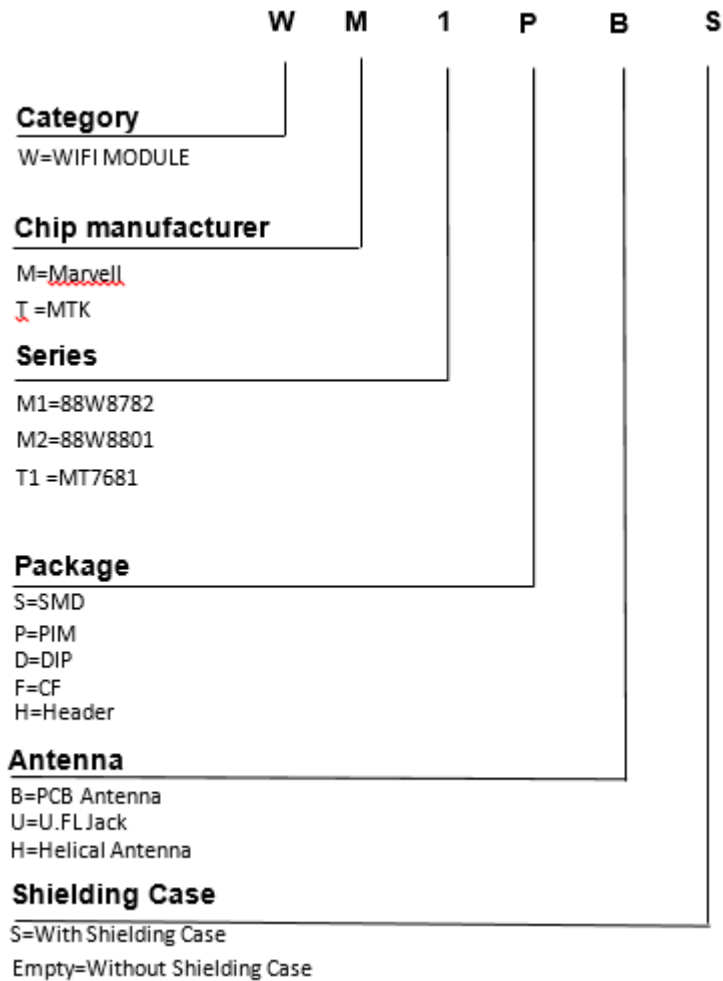
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This device complies with Part 15 of the FCC Rules / Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference 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 facon à ce que la population ne puisse
y être exposée à une distance de moin de 20 cm. Installer les antennes de facon à ce
que le personnel ne puisse approcher à 20 cm ou moins de la position centrale de l'antenne.
La FCC des éltats-unis stipule que cet appareil doit être en tout temps éloigné d'au
moins 20 cm des personnes pendant son functionnement.

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: 2ACDZ-3301SBSL and IC: 21239-3301SBSL"