65-VF438-P2 USB stick Adapter (US422D_H) Product Specification

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802.11a/b/g/n USB stick Adapter
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Product Description

QUALCOMM's 65-VF438-P2 USB stick Adapter design is based on QUALCOMM's advanced multi-radio WFB4130 Baseband/MAC IC and WFR4031 RF IC, an IEEE 802.11a/b/g/n wireless LAN solution that sends and receives data at up to 300 Mbps. Using QUALCOMM's advanced chipset with patented True MIMO™ smart antenna technology, QUALCOMM WFB400-based products provide unprecedented levels of 802.11a/b/g/n range and throughput, previously unachievable speed and spectral-efficiency, full Wi-Fi product interoperability for IEEE 802.11b/g/n and IEEE 802.11a/b/g/n global regulatory compliance.

Chipset

- WFB4130 Single Chip integrated Baseband and MAC
- WFR4031 Single Chip 2.4/5 GHz 2Tx/3Rx transceiver

Key Features and Benefits

The fourth generation, QUALCOMM's IEEE 802.11n True MIMO™ chipset, provides the implementer of access points, home gateways, WLAN clients, consumer electronics and multimedia entertainment, embedded wireless laptop/desktop/peripheral products with the following key features:

- IEEE 802.11n, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g Network Standards
- MIMO link rates up to 300 Mbps
- 2.4/5 GHz Frequency Band Operation
- Receive Combining and Transmit Diversity
- Dynamically adjusts between 20 and 40 MHz[1] operation on a frame by frame basis
- Interoperability with IEEE 802.11b/g, 802.11a/b/g , 802.11a/b/g/n and pre-standard 802.11n Draft 1.0 and 2.0 products
- IEEE 802.11d support
- IEEE 802.11b Long / Short Preamble support on a frame-by-frame basis
- Transmit rate based power control

Additional Hardware Features

- Enhanced interference avoidance

[1] 40 MHz mode at frequencies requiring DFS (Dynamic Frequency Selection) is governed by regulatory certification.

- Programmable defer / detect thresholds
- Closed loop Tx power control
- Automatic power-on and temperature-based calibration
- Worldwide regulatory EEPROM
- RoHS compliant to directive 2002/95/EC (PCB, components, solder)

Figure 1 65-VF438-P2 USB stick Adapter (top view, without case—top-- and with case--bottom)

Data Rates Supported

- IEEE 802.11b: 1 - 11 Mbps
- IEEE 802.11g: 1 - 54 Mbps
- IEEE 802.11a 1 – 54 Mbps
- IEEE 802. 11n: 6.5 – 144 Mbps (20 MHz channel)
  13.5 – 300 Mbps (40 MHz channel)
- Proprietary: 24 – 126 Mbps (20 MHz channel)
  12 – 300 Mbps (40 MHz channel)

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Modulation Types Supported

- OFDM: BPSK, QPSK, 16QAM, 64QAM
- DSSS: DBPSK, DQPSK, CCK

Security Features

- Hardware Support for 64-bit (24-bit IV + 40-bit Key) and 128-bit (24-bit IV + 104-bit Key) WEP encryption
- TKIP encryption
- CCMP (AES) encryption
- Hardware Support for Wi-Fi Protected Access WPA/WPA2 Personal/Enterprise authentication
- 802.1x supplicant

Quality of Service (QoS) and Value-Added MAC Features

- WMM
- WMM-SA
- IEEE 802.11e QoS

Antenna Connections

- Built-in 2.4/5 GHz antennas
- RF inline coaxial switch connectors for mass production test

Manufacturing-Ready Software

- Manufacturing Test Support Utilities
- Windows Vista 32 and 64 bit (upon MS general release),Windows XP (SP1/SP2) and Windows 2000 (SP4) drivers

Interfaces

- 5 volt Universal Serial Bus (USB 2.0) compliant

LEDs

Green

• “Link” or “Association” at D4
•” Network” or “Power” at D5

Physical

- Adapter contains a USB A-Type receptacle

Operating Voltage

- 5V +/- 10%

Recommended Operating Temperature Range

- 0 to +70 C^{o} ambient

Recommended Operating Humidity Range

- 15% - 95%, non-condensing

Recommended Storage Temperature Range

- -25 to +85 Cº ambient

Recommended Storage Humidity Range

- Maximum 95%, non-condensing

Peak Power Consumption

All power consumption figures for 5 V power supply. Power Consumption definitions are as follows:

- Peak Transmit (Tx). Power consumption during packet transmission (this is a "maximum" number).
- Peak Receive (Rx). Power consumption during packet reception (this is a "maximum" number).
- Idle and Connected: Power consumption when a station is associated with an access point and power save mode is set to maximum (i.e. the station is sleeping between beacons, this is an average number).
- Idle and not Connected: Power consumption when a station has not associated with an access point and power save mode is set to maximum (i.e. sleeping between scans, this is an average number).

Mode	2.4 GHz (Watts)
Peak Tx	TBD
Peak Rx	TBD
Idle and Connected*	TBD
Idle and not Connected	TBD
Sleep**	TBD

Table 1 2.4 GHz Power Consumption

Mode	5 GHz (Watts)
Peak Tx	TBD
Peak Rx	TBD
Idle and Connected*	TBD
Idle and not Connected	TBD
Sleep**	TBD

Table 2 5 GHz Power Consumption

* Assumes the adapter wakes up for each 802.11 beacon.

** "802.11 sleep" in between beacons, where most of the radio is shut down.

Typical Receiver Sensitivity

The following tables depict target Rx Sensitivity in dBm as defined in IEEE 802.11 specification(s).

NOTE: Tx Power and Rx Sensitivity alone are not sufficient to assess MIMO performance in a multipath environment. The MIMO radio architecture and core DSP algorithms play a far greater role in determining how well a MIMO radio performs -- a well architected MIMO radio with similar Rx sensitivity as a poorly designed MIMO radio provides much better performance. Real world benchmark testing is required to assess the performance of various MIMO radios.

802.11b Rx Sensitivity

2.4 GHz IEEE 11b	(8% PER)
Data Rate Mbps	RX Sensitivity dBm
1	-101.0
2	- 98.0
5.5	- 97.0
11	- 93.0

Table 3 802.11b Rx Sensitivity

NOTE: Reference P57, IEEE Std 802.11b-1999: FER shall be less than $8x10^{-2}$ at a PSDU length of 1024 octets.

802.11g Rx sensitivity

2.4 GHz IEEE 802.11g	(10% PER)
Data Rate Mbps	**Rx Sensitivity dBm**
6	- 99.5
9	- 98.0
12	- 96.5
18	- 94.0
24	- 92.0
36	- 89.5
48	- 86.5
54	- 84.0

Table 4 802.11g Rx sensitivity

NOTE: Reference, P29, IEEE Std 802.11g-2003: PER shall be less than 10% at a PSDU length of 1000 bytes.

802.11a Rx sensitivity

5 GHz IEEE 802.11a	(10% PER)
Data Rate Mbps	**Rx Sensitivity dBm**
6	- 95.5
9	- 94.0
12	- 92.5
18	- 90.0
24	- 88.0
36	- 85.5
48	- 82.5
54	- 80.0

Table 5 802.11a Rx sensitivity

NOTE: Reference, P31, IEEE Std 802.11a-1999: PER shall be less than 10% at a PSDU length of 1000 bytes.

Table 6 802.11n 20 MHz 2.4 GHz Rx sensitivity

IEEE 802.11n 2.4 GHz	(10% PER)	20 MHz	Channel
MCS Index	20 MHz 800 ns GI Data Rate Mbps	20 MHz 400 ns GI Data Rate Mbps	Rx Sensitivity
MCS 0	6.5	7.2	- 97.5
MCS 1	13.0	14.4	- 94.5
MCS 2	19.5	21.7	- 92.5
MCS 3	26.0	28.9	- 90.0
MCS 4	39.0	43.0	- 87.5
MCS 5	52.0	57.8	- 85.0
MCS 6	58.5	65.0	- 82.0
MCS 7	65.0	72.2	- 80.0
MCS 8	13.0	14.4	- 95.0
MCS 9	26.0	28.9	- 92.0
MCS 10	39.0	43.0	- 90.0
MCS 11	52.0	57.8	- 87.0
MCS 12	78.0	86.7	- 85.0
MCS 13	104.0	115.6	- 82.0
MCS 14	117.0	130.0	- 79.5
MCS 15	130.0	144.4	- 77.5
MCS 32	130.0	144.4	- 95.5

Table 7 802.11n 40MHz 2.4 GHz Rx sensitivity

IEEE 802.11n 2.4 GHz	(10% PER)	20 MHz	Channel
MCS Index	40 MHz 800 ns GI Data Rate Mbps	40 MHz 400 ns GI Data Rate Mbps	Rx Sensitivity
MCS 0	6.5	7.2	- 94.5
MCS 1	13.0	14.4	- 91.5
MCS 2	19.5	21.7	- 89.5
MCS 3	26.0	28.9	- 87.0
MCS 4	39.0	43.0	- 84.5
MCS 5	52.0	57.8	- 82.0
MCS 6	58.5	65.0	- 79.0
MCS 7	65.0	72.2	- 77.0
MCS 8	13.0	14.4	- 92.0
MCS 9	26.0	28.9	- 89.0
MCS 10	39.0	43.0	- 87.0
MCS 11	52.0	57.8	- 84.0
MCS 12	78.0	86.7	- 82.0
MCS 13	104.0	115.6	- 79.0
MCS 14	117.0	130.0	- 76.5
MCS 15	130.0	144.4	- 74.5
MCS 32	130.0	144.4	- 92.5

IEEE 802.11n 5 GHz	(10% PER)	20 MHz	Channel
MCS Index	20 MHz 800 ns GI Data Rate Mbps	20 MHz 400 ns GI Data Rate Mbps	Rx Sensitivity
MCS 0	6.5	7.2	- 95.5
MCS 1	13.0	14.4	- 92.5
MCS 2	19.5	21.7	- 90.5
MCS 3	26.0	28.9	- 88.0
MCS 4	39.0	43.0	- 85.5
MCS 5	52.0	57.8	- 83.0
MCS 6	58.5	65.0	- 80.0
MCS 7	65.0	72.2	- 78.0
MCS 8	13.0	14.4	- 93.0
MCS 9	26.0	28.9	- 90.0
MCS 10	39.0	43.0	- 88.0
MCS 11	52.0	57.8	- 85.0
MCS 12	78.0	86.7	- 83.0
MCS 13	104.0	115.6	- 80.0
MCS 14	117.0	130.0	- 77.5
MCS 15	130.0	144.4	- 75.5

Table 8 802.11n 20 MHz 5 GHz Rx sensitivity

802.11n 40 MHz 5 GHz Rx sensitivity

IEEE 802.11n	(10% PER)	40 MHz	Channel
MCS Index	40 MHz 800 ns GI Data Rate Mbps	40 MHz 400 ns GI Data Rate Mbps	Rx Sensitivity
MCS 0	13.5	15.0	- 92.5
MCS 1	27.0	30.0	- 89.5
MCS 2	40.5	45.0	- 87.5
MCS 3	54.0	60.0	- 85.0
MCS 4	81.0	90.0	- 82.5
MCS 5	108.0	120.0	- 80.0
MCS 6	121.5	135.0	- 77.0
MCS 7	135.0	150.0	- 75.0
MCS 8	27.0	30.0	- 90.0
MCS 9	54.0	60.0	- 87.0
MCS 10	81.0	90.0	- 85.0
MCS 11	108.0	120.0	- 82.0
MCS 12	162.0	180.0	- 80.0
MCS 13	216.0	240.0	- 77.0
MCS 14	243.0	270.0	- 74.5
MCS 15	270.0	300.0	- 72.5

Table 9 802.11n 40 MHz 5 GHz Rx sensitivity

Operating Frequencies/Bands

Actual channels/frequencies supported for a given country are governed by regulatory requirements and regulated by EEPROM contents and software.

Supported 2.4 GHz Channels	Frequencies		Channels	Frequencies
Channel	Frequency		Channel	Frequency
1	2412		8	2447
2	2417		9	2452
3	2422		10	2457
4	2427		11	2462
5	2432		12	2467
6	2437		13	2472
7	2442			

Supported 5 GHz Channels	Frequencies		Channels	Frequencies
Channel	Frequency		Channel	Frequency
36	5180		116	5580
40	5200		120	5600
44	5220		124	5620
48	5240		128	5640
52	5260		132	5660
56	5280		136	5680
60	5300		140	5700
64	5320		149	5745
100	5500		153	5765
104	5520		157	5785
108	5540		161	5805
112	5560		165	5825

Table 10 Operating Frequencies/Bands

Maximum Transmit Output Power

In typical end user product operation, actual transmit power will be limited based on local regulatory requirements and EEPROM configuration.

NOTE: Tx Power and Rx Sensitivity alone are not sufficient to assess MIMO performance in a multipath environment. The MIMO radio architecture and core DSP algorithms play a far greater role in determining how well a MIMO radio performs -- a well architected MIMO radio with similar Rx sensitivity as a poorly designed MIMO radio provides much better performance. Real world benchmark testing is required to assess the performance of various MIMO radios.

Tx Power		
IEEE Mode	Per Chain (dBm)	Total Tx Power (dBm)
11b	14	17
11g	14	17
11n	14	17

Table 11 Tx Power 2.4 GHz

Tx Power		
IEEE Mode	Per Chain (dBm)	Total Tx Power (dBm)
11a	12	15
11n	12	15

Table 12 Tx Power 5 GHz

Physical Dimensions

Weight: 8 grams (including shield and excluding housing which is to be designed and supplied by the customer)

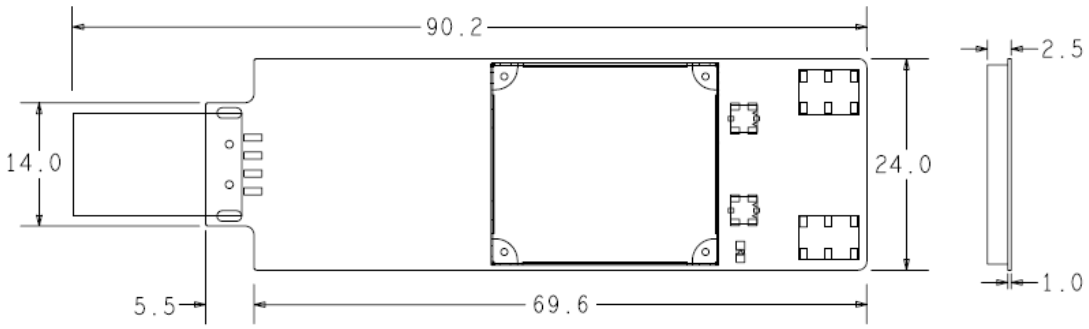

Figure 2 PCB and Shield Mechanical Drawing (dimensions in millimeters)