802.11n a/b/g 2x2 wifi and Bluetooth 4.0 + HS combo PCIe half-mini card, WB222/AR9462

Model: DHXA-222

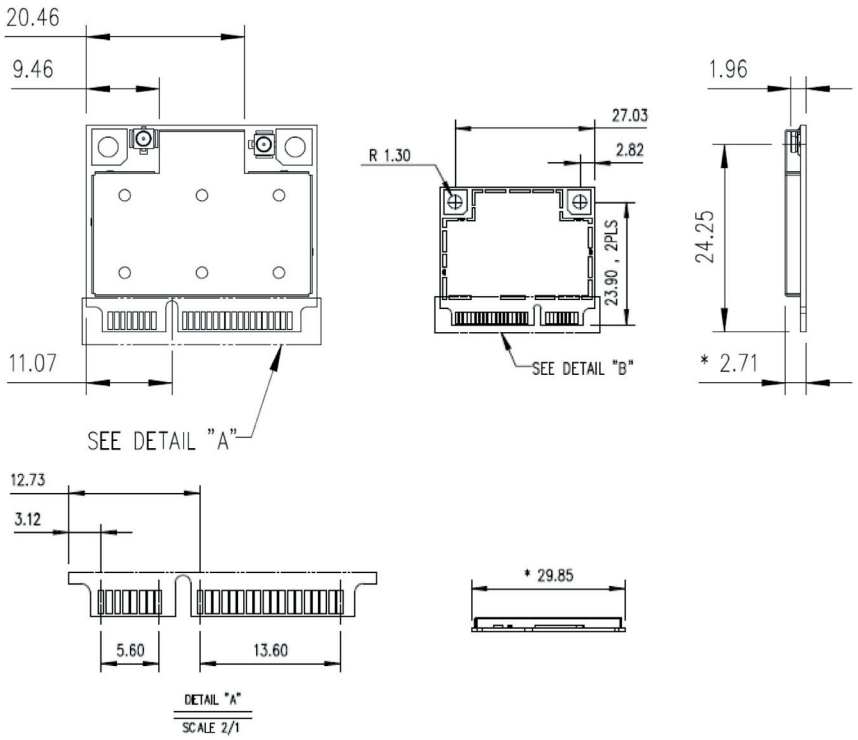
DHXA-222 is a single-chip solution that combines dual-band (2.4/5GHz) 2-stream 802.11n WiFi and Bluetooth 4.0 technology on a single half-size mini card in PCIe form factor designed for notebooks, netbooks, and tablets. DHXA-222 brings Atheros' industry-leading dual-band 2x2 802.11n performance and latest Bluetooth 4.0 specification to increasingly smaller computing and CE devices. Dual-band 2x2 802.11n WiFi delivers data rate of 300 Mbps and TCP throughput of more than 200 Mbps in 2x2 mode. Unique Signal-Sustain Technology™ (SST) increases rate-over-range performance by up to 100% at short range, 50% at mid-range, and 25% at long range. Bluetooth 4.0 supports high speed and low energy operation, and supports enhanced data rate (EDR) of both 2 Mbps (4-DQPSK) and 3 Mbps (8-DPSK).

Advanced integrated coexistence features deliver superior WiFi/Bluetooth coexistence to ensure the best possible wireless experience, maximum performance, and lowest power consumption.

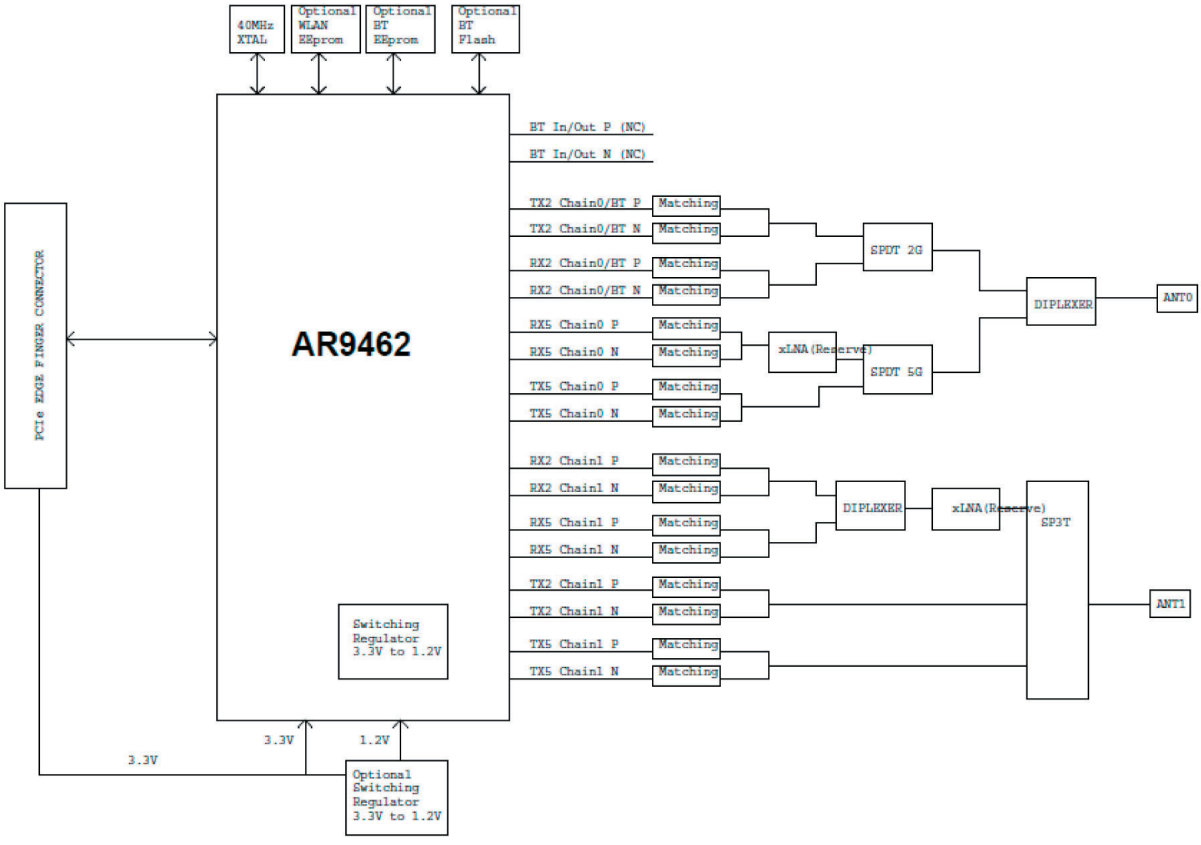
Key Features:

- Dual-band (2.4/5GHz) 802.11n 2Tx/2Rx WiFi and Bluetooth 4.0 + HS combo solution on a single half-size mini card in PCIe form factor is ideal for embedding into increasingly smaller computing and CE devices.
- Dual-band (2.4/5GHz) 2-stream 802.11n offers a maximum PHY rate of 300 Mbps.
- Using Dynamic MIMO power Save to conserve power with 1x1 downshift.
- Signal-Sustain Technology™ (SST) increases rate-over-range performance by up to 100% at short range, 50% at mid-range, and 25% at long range.
- Bluetooth supports high speed and low energy operation
- Bluetooth supports enhanced data rate (EDR) of both 2 Mbps (4-DQPSK) and 3 Mbps (8-DPSK).
- Advanced integrated coexistence features deliver superior WiFi/Bluetooth coexistence to ensure the best possible wireless experience, maximum performance, and lowest power consumption.
- Supports Fast Channel Switch (FCS) to reduce channel switching time to as little as 1ms within band and 2 ms in between the 2.4GHz and 5GHz bands.
- Supports antenna sharing between Bluetooth and WLAN.
- Driver support for Windows XP/Vista/7 and Linux enables system integrators to quickly and easily employ multi-radio coexistence on one platform with trouble-free WiFi and Bluetooth integration.
- RoHS compliance meets environment-friendly requirement.

Outline

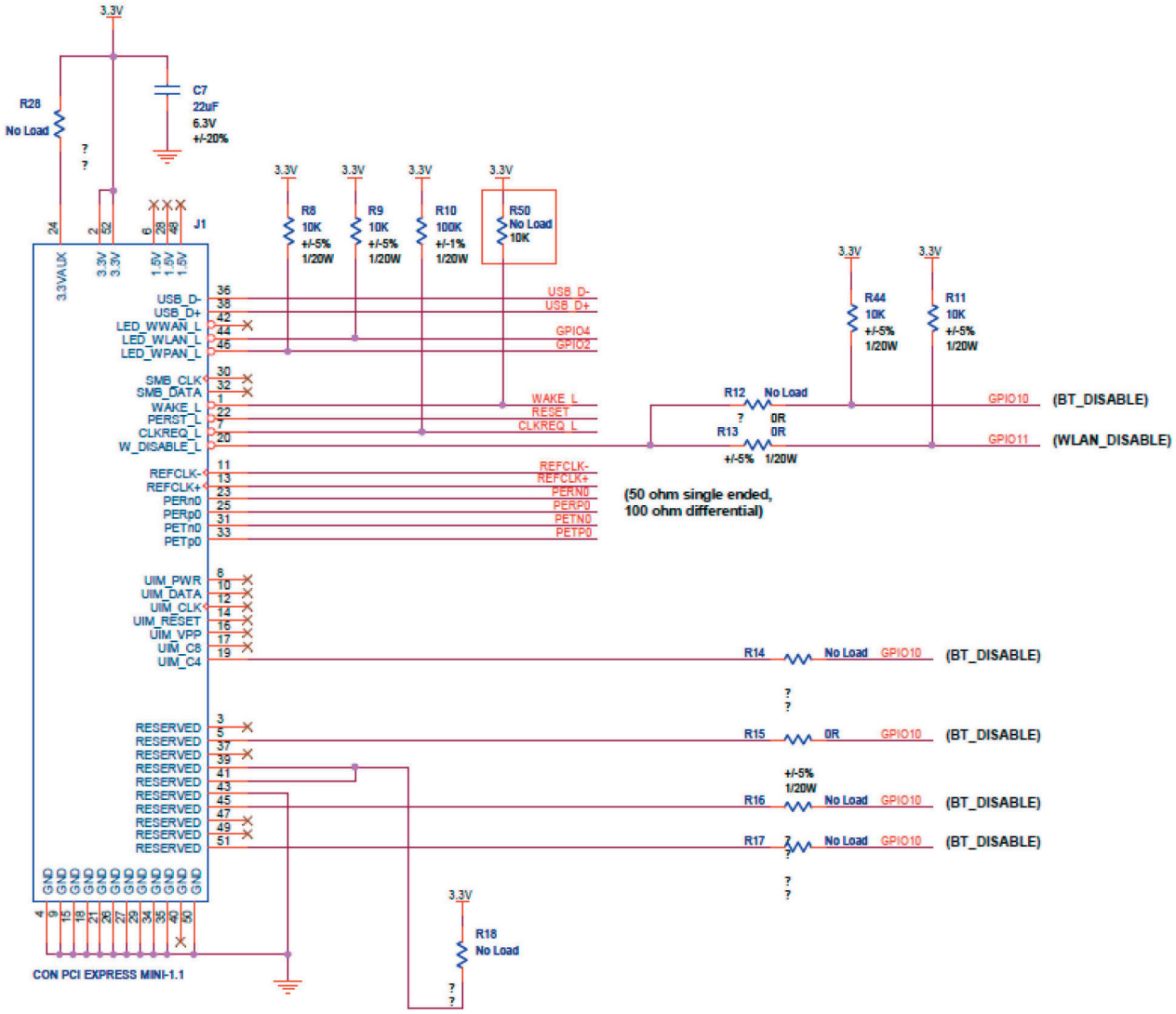


Hardware Block Diagram



Pin Assignment:

- **Connector PCIe Mini-1.1 pin define**

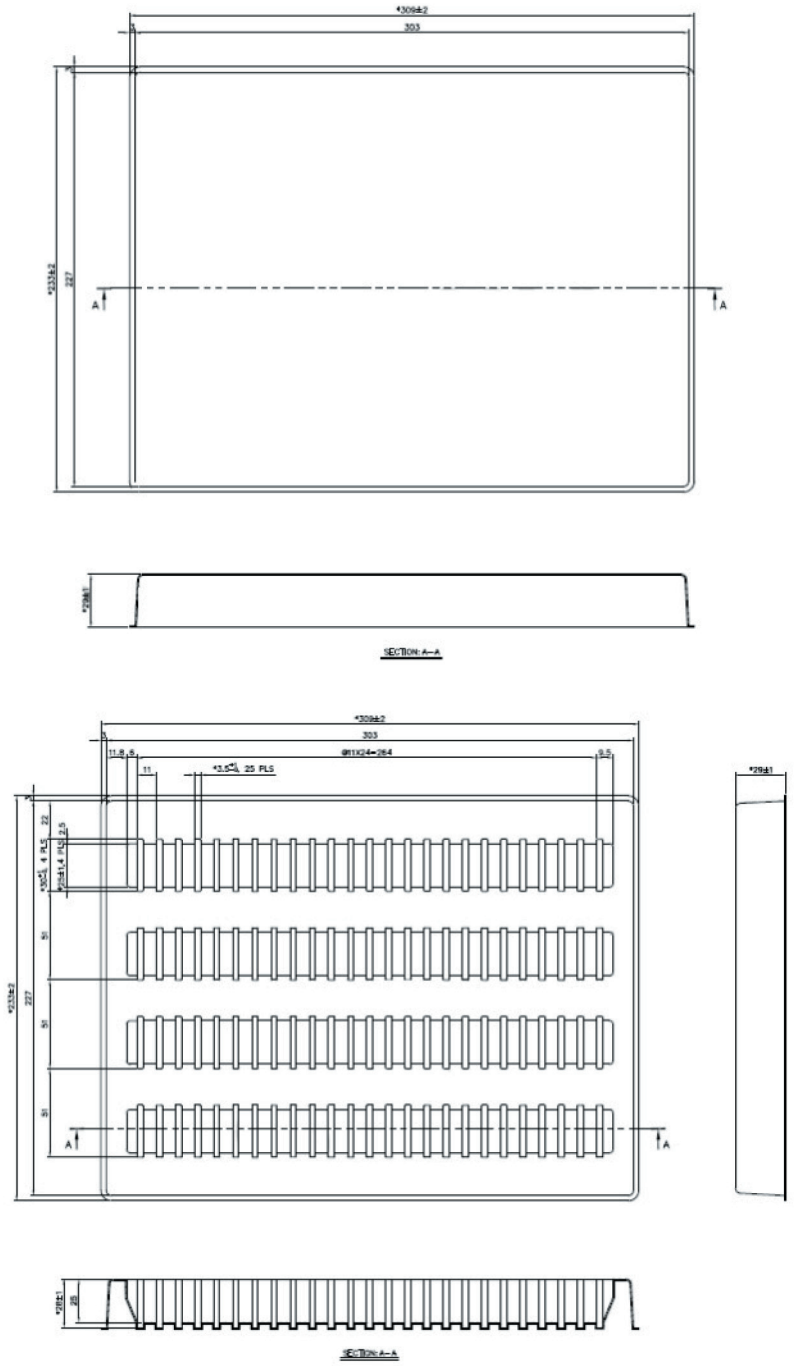


- **the pin definitions follow the minicard standard**

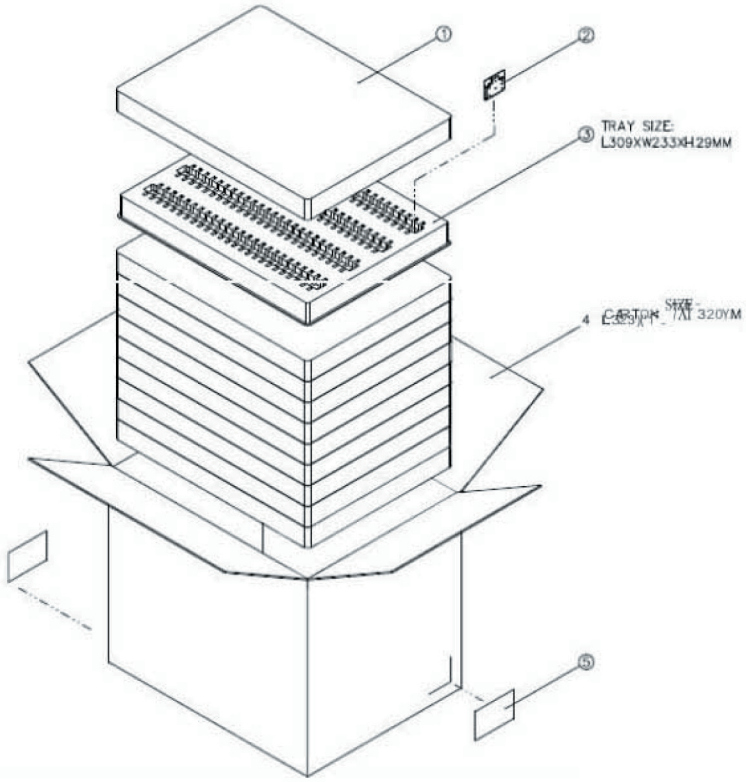
Pin No.	Name	Direction	Description
4,9,15,18,21,26,27,29,34,35,37,43,50	GND	---	Ground.
40	GND	---	No connection.
R24	RESERVED	---	Tied to ground.
47,49	RESERVED	---	No connection.
39,41	RESERVED	---	Reserved for 3.3V
51	RESERVED	---	Reserved for BT_DISABLE
45	RESERVED	---	Reserved for BT_DISABLE
5	RESERVED	---	Reserved for BT_DISABLE
3	RESERVED	---	No connection.
19	RESERVED	---	Reserved for BT_DISABLE
8,10,12,14,16,17	NC	---	No connection.
33	PETp0	Analog input signal	Differential receive
31	PETn0	Analog input signal	Differential receive
25	PERP0	Analog output signal	Differential trnasmit
23	PERN0	Analog output signal	Differential trnasmit
13	REFCLK+	Analog input signal	Differential reference clock (100MHz).
11	REFCLK-	Analog input signal	Differential reference clock (100MHz).
20	WLAN_DISABLE_L	I/O	WLAN DISABLE
7	CLKREQ_L	A digital output signal with open drain	Reference clock request, open drain
22	PERST_L	Input siganls with weak internal pull-down, to prevent siganls from floating when left open	PCI Express reset with weak pull down
1	WAKE_L	A digital output signal with open drain	Reserved for 3.3V or WAKE2_L (Request to service a fuction-initiated wake event, open drain).
32	SMB_DATA	---	No connection.
30	SMB_CLK	---	No connection.
46	LED_WPAN_L	O	No connection.
44	LED_WLAN_L	O	GPIO6
42	LED_WWAN_L	---	No connection.
38	USB_D+	I/O	USB_P
36	USB_D-	I/O	USB_N
6,28,48	1.5V	---	No connection.
2,52	3.3V	---	3.3V
24	3.3V	---	3.3V

Packing

Tray Box: 100 pcs/tray box, 309mm (L) x 233mm (W) x 29mm (H)



Carton: 10 tray box/carton or 1,000 pcs/carton, 323mm (L) x 247mm (W) x 320mm (H)



<table>
<tr><th colspan="2">WiFi portion Specifications:</th></tr>
<tr><td>Main Chipset</td><td>Atheros® AR9462</td></tr>
<tr><td>Tx/Rx</td><td>2T2R</td></tr>
<tr><td>Standard Conformance</td><td>802.11a, 802.11b, 802.11g, and 802.11n</td></tr>
<tr><td>Frequency Range</td><td>▪ USA: 2.400 – 2.483GHz, 5.15 – 5.35GHz, 5.47 – 5.725GHz, 5.725 – 5.85GHz
▪ Europe: 2.400 – 2.483GHz, 5.15 – 5.35GHz, 5.47– 5.725GHz
▪ Japan: 2.400 – 2.497GHz, 5.15– 5.35GHz, 5.47 – 5.725GHz
▪ China: 2.400 – 2.483GHz, 5.725 – 5.85GHz</td></tr>
<tr><td>Form Factor</td><td>half mini card</td></tr>
<tr><td>Interface</td><td>PCI Express ® mini-card rev. 1.2</td></tr>
<tr><td>Channel Spacing</td><td>5MHz</td></tr>
<tr><td>Operating Channels</td><td>▪ 802.11a/n
▫ USA/Canada: 12 non-overlapping channels
▫ Major Europe Countries: 19 non-overlapping channels
▫ Japan: 19 non-overlapping channels
▫ China: 5 non-overlapping channels
▪ 802.11b/g/n
▫ USA/Canada: 11 (1-11)
▫ Major Europe Countries: 13 (1-13)
▫ France: 4 (10-13)
▫ Japan: 14 on 802.11b (1-13 or 14th), 13 on 802.11g (1-13)
▫ China: 13 (1-13)</td></tr>
<tr><td>Data Rate</td><td>▪ 802.11a: 6, 9, 12, 18, 24, 36, 48,54Mbps
▪ 802.11b: 1, 2, 5.5 and 11Mbps
▪ 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps
▪ 802.11n:
▫ 20MHz bandwidth:
◦ 1Nss: 65Mbps @ 800GI, 72.2Mbps @ 400GI (Max.)
◦ 2Nss: 130Mbps @ 800GI, 144.4Mbps @ 400GI (Max.)
▫ 40MHz bandwidth:
◦ 1Nss: 135Mbps @ 800GI, 150Mbps @ 400GI (Max.)
◦ 2Nss: 270Mbps @ 800GI, 300Mbps @ 400GI (Max.)</td></tr>
<tr><td>Power Consumption @25C</td><td>
<table>
<tr><td></td><td>802.11a</td><td>802.11b</td><td>802.11g</td><td>802.11n (2.4GHz)</td><td>802.11n (5GHz)</td></tr>
<tr><td></td><td>Avg.(mA)</td><td>Avg.(mA)</td><td>Avg.(mA)</td><td>Avg.(mA)</td><td>Avg.(mA)</td></tr>
<tr><td>Continue Tx</td><td>550</td><td>405</td><td>436</td><td>365</td><td>445</td></tr>
</table>
Remark: the maximum current consumption will be impacted by radiation environment abd the driver mechanism.
</td></tr>
</table>

Output Power (each chain, power tolerance +2/-2dB)

- 802.11a:

Test Frequency	6-24M Target	36M Target	48M Target	54M Target
5180	15dBm	14dBm	13dBm	11dBm
5320	15dBm	14dBm	13dBm	11dBm
5825	15dBm	14dBm	13dBm	11dBm

- 802.11b: +17dBm
- 802.11g:

Test Frequency	6-24M Target	36M Target	48M Target	54M Target
2412	17dBm	17dBm	16dBm	15dBm
2437	17dBm	17dBm	16dBm	15dBm
2472	17dBm	17dBm	16dBm	15dBm

- 802.11a:

Test Frequency	6-24M Target	36M Target	48M Target	54M Target
5180	15dBm	14dBm	13dBm	11dBm
5320	15dBm	14dBm	13dBm	11dBm
5825	15dBm	14dBm	13dBm	11dBm

- 802.11n: 5GHz/HT20 @800GI (400GI):

Test Frequency	MCS 0/8	MCS/ 1/9	MCS 2/10	MCS/ 3/11	MCS/ 4/12	MCS 5/13	MCS/ 6/14	MCS/ 7/15
5180	14dBm	14dBm	14dBm	14dBm	13dBm	12dBm	11dBm	9dBm
5320	14dBm	14dBm	14dBm	14dBm	13dBm	12dBm	11dBm	9dBm
5825	14dBm	14dBm	14dBm	14dBm	13dBm	12dBm	11dBm	9dBm

- 802.11n: 5GHz/HT40 @800GI (400GI):

Test Frequency	MCS 0/8	MCS/ 1/9	MCS 2/10	MCS/ 3/11	MCS/ 4/12	MCS 5/13	MCS/ 6/14	MCS/ 7/15
5180	14dBm	14dBm	14dBm	14dBm	13dBm	12dBm	11dBm	9dBm
5320	14dBm	14dBm	14dBm	14dBm	13dBm	12dBm	11dBm	9dBm
5825	14dBm	14dBm	14dBm	14dBm	13dBm	12dBm	11dBm	9dBm

- 802.11n: 2.4GHz/HT20 @800GI (400GI):

Test Frequency	MCS 0/8	MCS/ 1/9	MCS 2/10	MCS/ 3/11	MCS/ 4/12	MCS 5/13	MCS/ 6/14	MCS/ 7/15
2412	17dBm	17dBm	17dBm	17dBm	17dBm	16dBm	15dBm	14dBm
2437	17dBm	17dBm	17dBm	17dBm	17dBm	16dBm	15dBm	14dBm
2472	17dBm	17dBm	17dBm	17dBm	17dBm	16dBm	15dBm	14dBm

- 802.11n: 2.4GHz/HT40 @800GI (400GI):

Test Frequency	MCS 0/8	MCS/ 1/9	MCS 2/10	MCS/ 3/11	MCS/ 4/12	MCS 5/13	MCS/ 6/14	MCS/ 7/15
2412	16dBm	16dBm	16dBm	16dBm	16dBm	16dBm	15dBm	14dBm
2437	16dBm	16dBm	16dBm	16dBm	16dBm	16dBm	15dBm	14dBm
2472	16dBm	16dBm	16dBm	16dBm	16dBm	16dBm	15dBm	14dBm

Receiver Sensitivity

	Data Rate	IEEE Spec. (dBm)	Typical/Maximum(dBm)
802.11a	BPSK(6M)	-82	-90/-88
	BPSK(9M)	-81	-90/-87
	QPSK(12M)	-79	-90/-86
	QPSK(18M)	-77	-88/-84
	16-QAM(24M)	-74	-85/-81
	16-QAM(36M)	-70	-80/-77
	64-QAM(48M)	-66	-77/-73
	64-QAM(54M)	-65	-76/-72
802.11b	DBPSK(1M)	NA	-93/-90
	DQPSK(5.5M)	NA	-90/-88
	CCK(11M)	NA	-87/-85
802.11g	BPSK(6M)	-82	-90/-88
	BPSK(9M)	-81	-92/-87
	QPSK(12M)	-79	-91/-86
	QPSK(18M)	-77	-88/-84
	16-QAM(24M)	-74	-85/-81
	16-QAM(36M)	-70	-81/-77
	64-QAM(48M	-66	-78/-73
	64-QAM(54M)	-65	-77/-72
802.11n/a HT20	BPSK(MCS0)	-82	-90/-87
	QPSK(MCS1)	-79	-89/-84
	QPSK(MCS2)	-77	-87/-82
	16-QAM(MCS3)	-74	-84/-79
	16-QAM(MCS4)	-70	-80/-75
	64-QAM(MCS5)	-66	-75/-71
	64-QAM(MCS6)	-65	-74/-70
	64-QAM(MCS7)	-64	-72/-69
802.11n/a HT40	BPSK(MCS0)	-79	-88/-84
	QPSK(MCS1)	-76	-85/-81
	QPSK(MCS2)	-74	-83/-79
	16-QAM(MCS3)	-71	-79/-76
	16-QAM(MCS4)	-67	-76/-72
	64-QAM(MCS5)	-63	-73/-68
	64-QAM(MCS6)	-62	-72/-67
	64-QAM(MCS7)	-61	-71/-66

Receiver Sensitivity

	Data Rate	IEEE Spec. (dBm)	Typical/Maximum(dBm)
802.11n/g HT20	BPSK(MCS0)	-82	-90/-87
	QPSK(MCS1)	-79	-89/-84
	QPSK(MCS2)	-77	-87/-82
	16-QAM(MCS3)	-74	-84/-79
	16-QAM(MCS4)	-70	-80/-75
	64-QAM(MCS5)	-66	-76/-71
	64-QAM(MCS6)	-65	-75/-70
	64-QAM(MCS7)	-64	-74/-69
802.11n/g HT40	BPSK(MCS0)	-79	-89/-84
	QPSK(MCS1)	-76	-86/-81
	QPSK(MCS2)	-74	-84/-79
	16-QAM(MCS3)	-71	-81/-76
	16-QAM(MCS4)	-67	-77/-72
	64-QAM(MCS5)	-63	-73/-68
	64-QAM(MCS6)	-62	-72/-67
	64-QAM(MCS7)	-61	-71/-66

Operation Distance

	Outdoor	Indoor
802.11a	50m @ 54Mbps 300m @ 6Mbps	30m @ 54Mbps 100m @ 6Mbps
802.11b	100m @ 11Mbps 200m @ 1Mbps	50m @ 11Mbps 100m @ 1Mbps
802.11g	100m @ 54Mbps 200m @ 6Mbps	50m @ 54Mbps 100m @ 6Mbp
802.11n	30m @ 300Mbps 30m @ 130Mbps 250m @ 6.5Mbps	20m @ 300Mbps 20m @ 130Mbps 100m @ 6.5Mbps

MAC Protocol	CSMA/CA with ACK architecture 32-bit MAC
Modulation Technique	▪ DSSS with CCK, DQPSK, DBPSK ▪ OFDM with BPSK, QPSK, 16QAM, 64QAM
Operation Voltage	3.3V ± 5%
Security	▪ 64-bit, 128-bit and 152-bit WEP encryption ▪ 802.1x authentication ▪ AES-CCM & TKIP
Operation Systems Supported	Windows 2000/XP/Vista/7 and Linux
Dimension	26.65 x 29.85 mm (± 0.15mm) x 1.0 mm (± 0.10mm)
Operation Temperature Range	-10˚C ~ +70˚C
Storage Temperature Range	-20˚C ~ +80˚C
Operating Humidity	15% - 95%, non-condensing
Storage Humidity	max. 95%, non-condensing
Regulation Compliance	Atheros WB222 FCC, CE…etc. certification per update from Atheros
Environment-Friendly Compliance	RoHS
Antenna	two SMT U.FL ultra-miniature coaxial antenna connectors (U.FL-R-SMT) (Main connector for WiFi only, ALT connector for WiFi or Bluetooth)

Bluetooth portion Specifications:	
Main Chipset	Atheros® AR9462
Standard Conformance	Bluetooth v4.0 + HS
Frequency Range	2.400 – 2.4835GHz
Frequency Tolerance	± 40kHz (typical)
Modulation Technique	frequency hopping, 1600 hops/sec.
Channel Spacing	1MHz
Channel Support	79 channels
Operation Voltage	3.3V ± 5%
Power Consumption@25C	<table><tr><th></th><th>Avg. (mA)</th></tr><tr><td>Idle mode</td><td>15.1</td></tr><tr><td>Continuous DH5 Tx</td><td>68.8</td></tr></table>
Output Power	2dBm typical, class 2 device (-6dBm < out power < 4dBm)
Receiver Sensitivity	-85dBm typical for pi/4-DQPSK, 0.1% BER
Operation Temperature Range	-10°C ~ +70°C
Storage Temperature Range	-20°C ~ +80°C
Antenna	one SMT U.FL ultra-miniature coaxial antenna connector (U.FL-R-SMT) (ALT connector for WiFi or Bluetooth)

Ordering Information:	
DHXA-222	802.11n a/b/g 2x2 wifi and Bluetooth 4.0 + HS combo PCIe half-mini card, WB222/AR9462
EX-11	half size to full size PCIe mini card bracket, 2 mounting screws included.