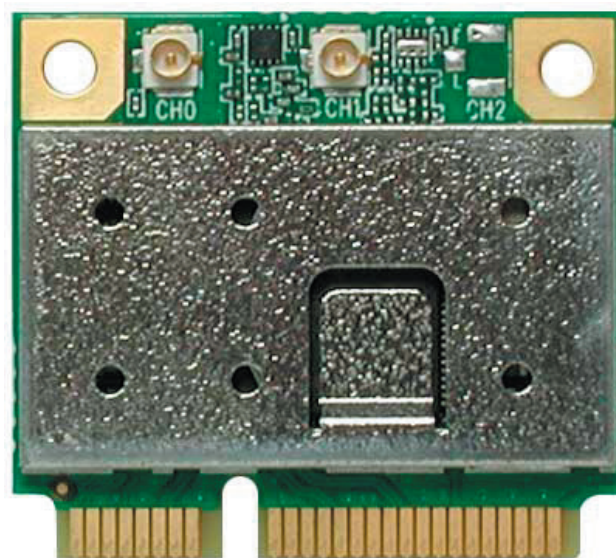




# DNXA-116 Information Sheet

802.11n a/b/g wifi 2x2 PCIe half-mini card, HB116 / AR9382



## Overview:

DNXA-116 is an 802.11n a/b/g wifi 2x2 in the smallest PCIe half-mini card interface designed to propel the industry forwarding and diverse needs of both consumer and enterprise applications. Atheros' Signal-Sustain Technology (SST) enhances rate-over-range performance to reach an impressive increase in rate-over-range of ~+100% at short range, ~+50% at mid range and ~+25% at long range.

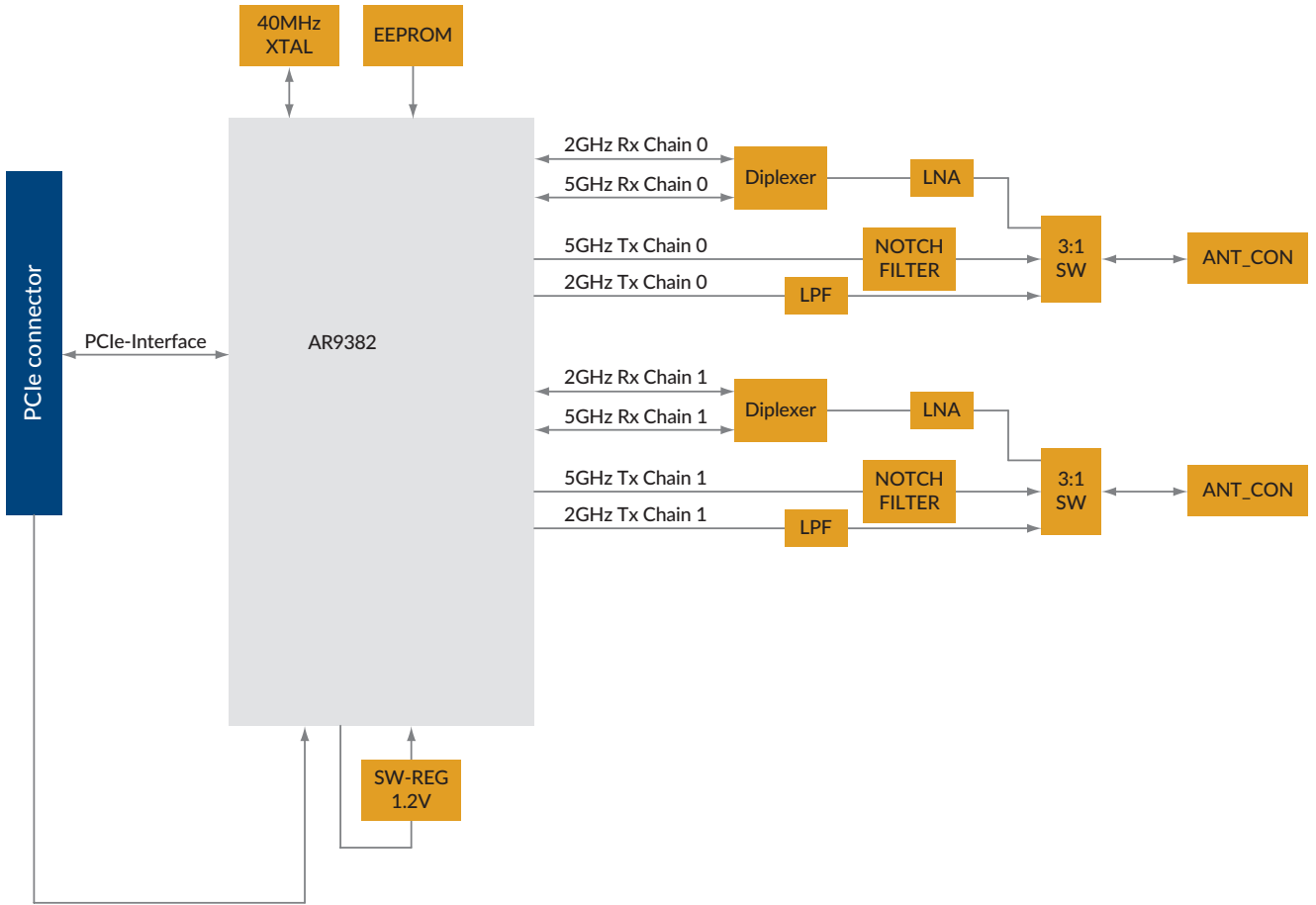
Despite its mighty performance, DNXA-116 consumes even less power in every operation mode – active TX, active RX, idle associated and sleep than the previous generation solution. It keeps the notebook and other

computing platforms running much longer on a single battery-charge, while providing TCP throughput of more than 200 Mbps when used in 2x2 mode. Atheros' Fast Channel Switch (FCS) reduces the channel switching time between the 2.4 GHz and 5 GHz bands from 10 ms to as little as 1 ms. Setting new standards in throughput, range, reliability, and power consumption, DNXA-116 delivers the ultimate wireless triple play experience for video, voice, and data transmission in the home, for the business, and on the road.

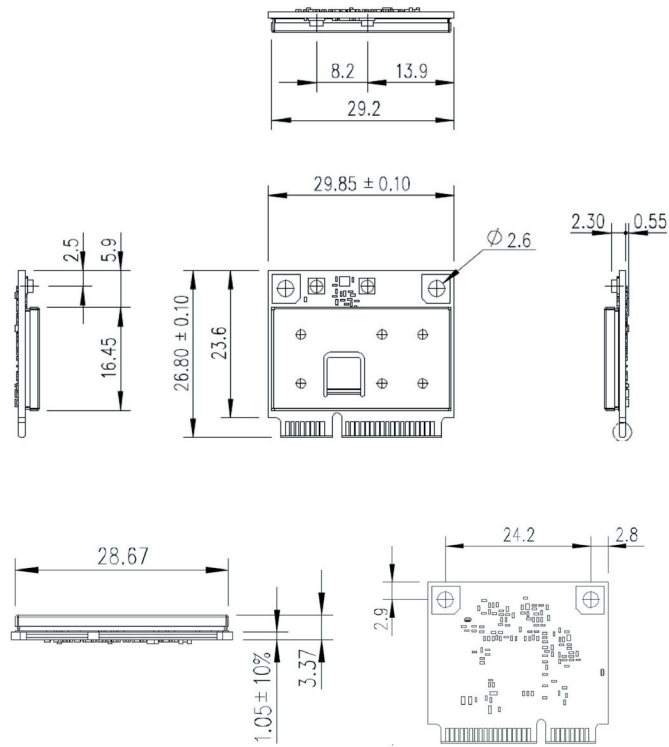
## Key Features:

- » The smallest dual-band PCIe interface in 2Tx/2Rx design is ideal for embedding into ultra-compact devices or embed additional mini cards with complimentary technologies.
- » Dual band 802.11 a/b/g/n supports 2Tx/2Rx 2-stream MIMO to enable PHY data rate up to 300Mbps link rate for 40MHz channel, six times the throughput of 802.11a and 802.11g.
- » Signal-Sustain Technology (SST) increases rate-over-range ~+100% at short range, ~+50% at mid-range, and ~+25% at long range.
- » Atheros' Fast Channel Switch (FCS) reduces the channel switching time between the 2.4 GHz and 5 GHz bands from 10 ms to as little as 1 ms.
- » Dynamic MIMO Power Save supports 1x1 down shift to lower power consumption.
- » Supports 20/40MHz channel to maximize bandwidth efficiency.
- » Windows XP/Vista/7/8 and ath9k drivers enable manufacturers to quickly and easily bring new bandwidth intensive applications to market with trouble-free WiFi integration.
- » Atheros Linux SDK sub-license available by project.
- » 802.11n compliance effectively interoperates with other chipsets.
- » Seamless roaming cross 802.11n, 802.11a, 802.11b, and 802.11g in Access Point covered distance.
- » Supports IEEE 802.11a/802.11b/802.11g backward compatibility allowing inter-operability among multiple wifi networks.
- » Supports 802.11x authentication, WPA, WEP-64, WEP-128, WEP-152 and 128-bit AES/TKIP encryption.
- » Two Hirose U.FL antenna connectors enable transmit and receive diversity for flexible 2x2 MIMO design.
- » RoHS compliance meets environment-friendly requirement.

# Block Diagram

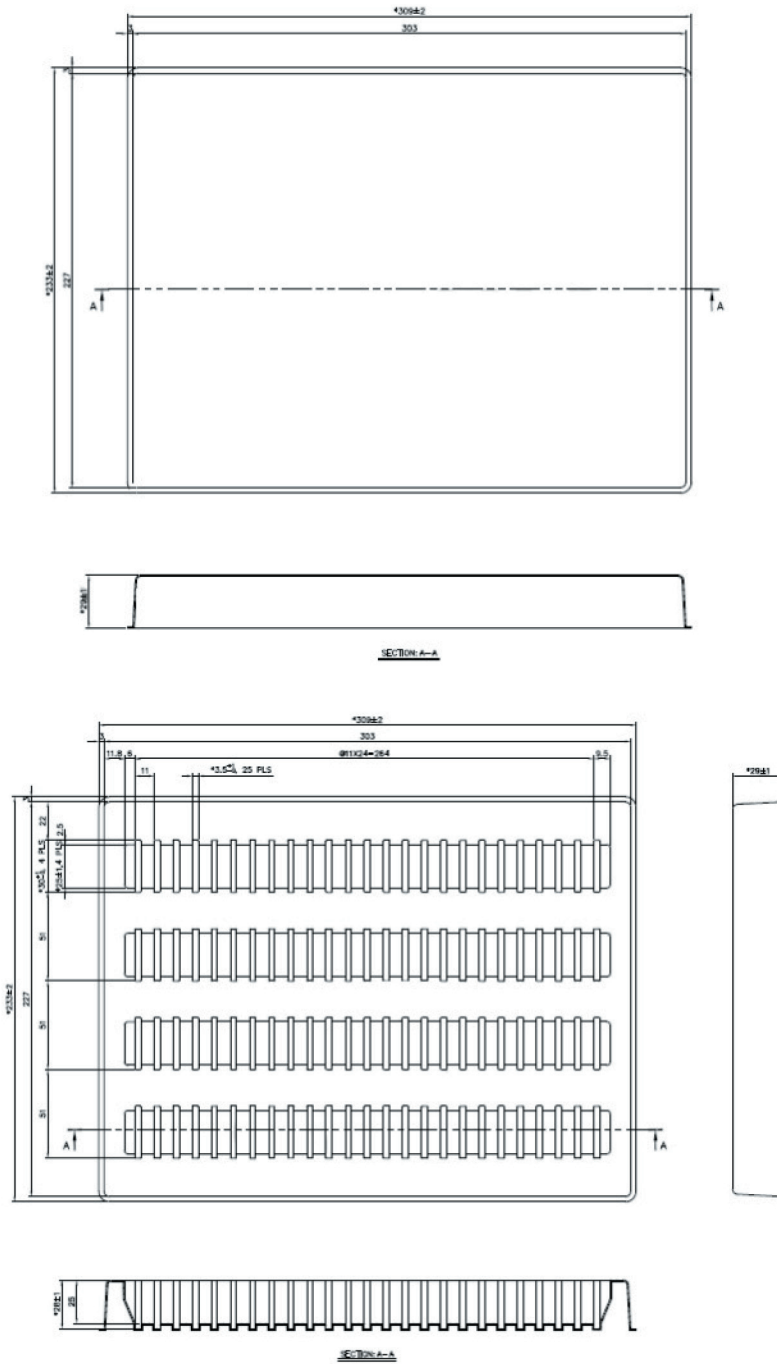


# Mechanical Outline

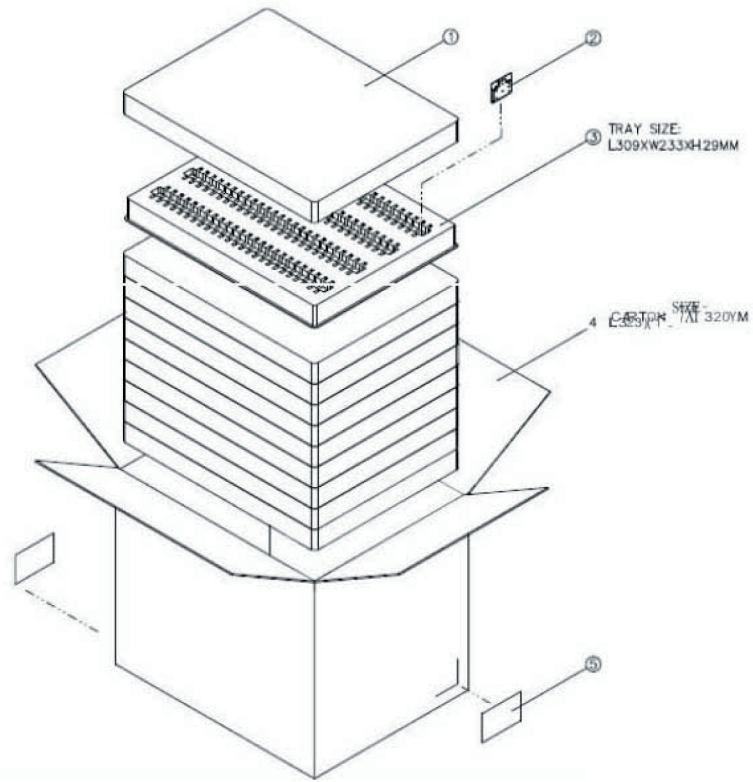


# Packing

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)

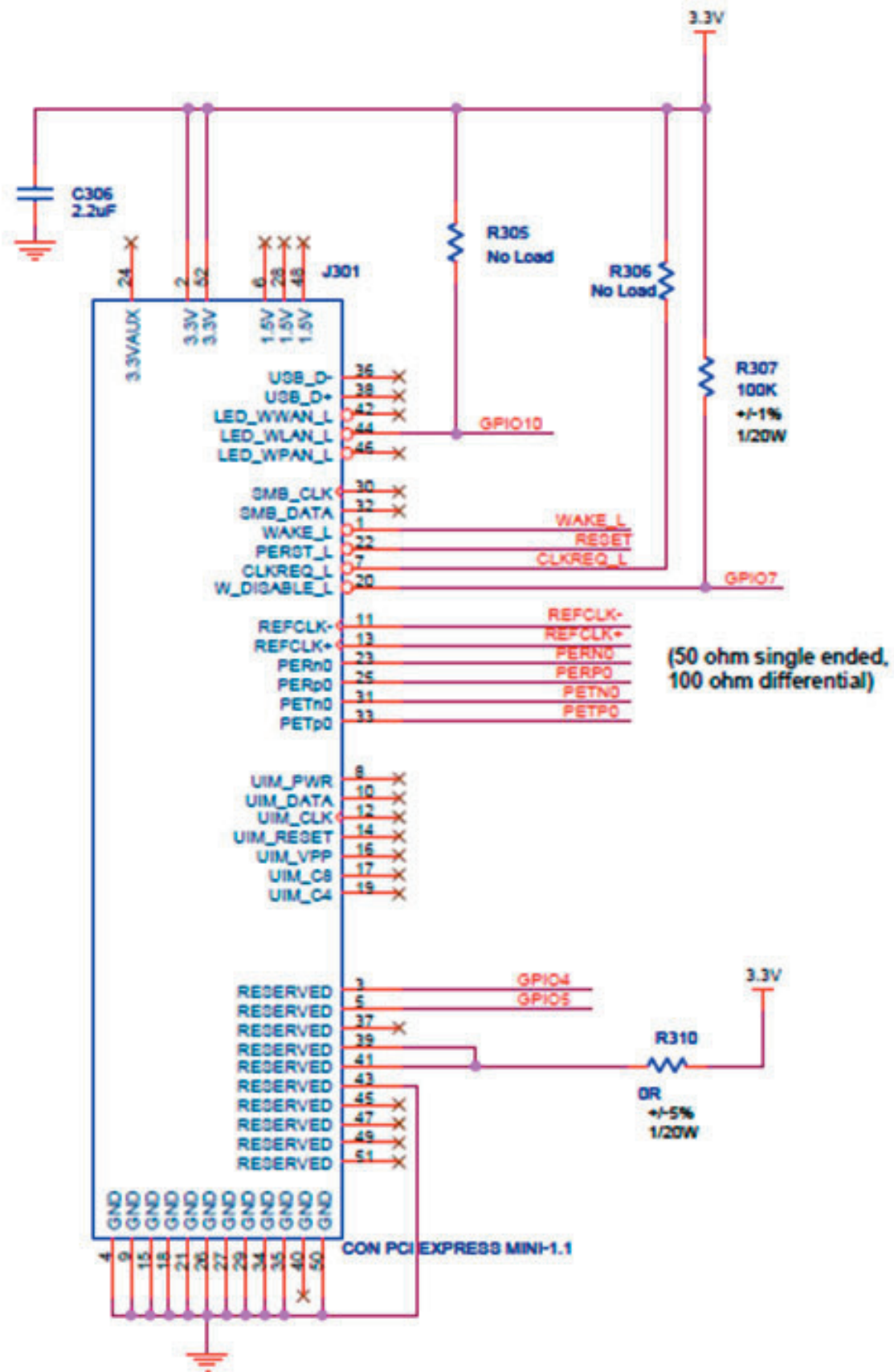


## Pin Denifition:

Pin No.	Name	Direction	Description
4,9,15,18,21,26,27,29,34,35,50	GND	-	Ground.
43	RESERVED	-	Tied to ground.
37,45,47,49,51	RESERVED	-	No connection.
39,41	RESERVED	-	Reserved for 3.3V.
40	GND	-	No connection.
3	RESERVED	I/O	Reserved for GPIO4.
5	RESERVED	I/O	Reserved for GPIO5.
8,10,12,14,16,17,19,	NC	-	No connection.
33	PETp0	Analog input signal	Differential receive
31	PETn0	Analog input signal	Differential receive
25	PERPO	Analog output signal	Differential trnasmit
23	PERPO	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	Reserved for GPIO7.
7	CLKREQ_L	A digital output signal with open drain	Reference clock request, open drain
22	PERST_L	Input siganls with weak nternal pull-down, to prevent siganls from floating	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	Reserved for GPIO10.
42	LED_WWAN_L	-	No connection.
38	USB_D+	I/O	No connection.
36	USB_D-	I/O	No connection.
6,28,48	1.5V	-	No connection.
2,52	3.3V	-	3.3V
24	3.3VAUX	-	No connection.





# Specifications:

Main Chipset                      Atheros® AR9382

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Tx/Rx                                2T2R MIMO (2x2 with MCS 0-15)

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Standard Conformance            802.11a, 802.11b, 802.11g, and 802.11n

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Spectral Bands                      USA:  
  » 2.400 – 2.483GHz  
  » 5.15 – 5.35GHz  
  » 5.725 – 5.85GHz  
  Europe:  
  » 2.400 – 2.483GHz  
  » 5.15 – 5.35GHz  
  Japan:  
  » 2.400 – 2.497GHz  
  » 5.15– 5.35GHz  
  China:  
  » 2.400 – 2.483GHz  
  » 5.725 – 5.85GHz

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Form Factor                         half mini card

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Interface                            PCI Express® mini-card rev. 1.1

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Channel Spacing                    20MHz

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## Operating Channels

### 802.11a/n

- » USA/Canada: 12 non-overlapping channels
- » Major Europe Countries: 8 non-overlapping channels
- » Japan: 8 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)

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## Data Rate

### 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.)

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## Power Consumption @25°C

	802.11a	802.11b	802.11g	802.11n(2.4GHz)	802.11n(5GHz)
100%	550mA	405mA	436mA	365mA	445mA
Tx duty					

Remarks: This can be treated as the peak current consumption during operation.

Output Power  
(only for maximum hardware capability, regardless the regulatory limit)

Power tolerance:

- » 2.4GHz:  $\pm 2$ dB
- » 5.18~5.32GHz:  $\pm 2$ dB
- » 5.5~5.825GHz: +2.5/-3dB

802.11a (Typical):

Test Frequencies	6-24_Target	36_Target	48_Target	54_Target
5180	15	15	14	12
5320	15	15	14	12
5825	15	15	14	12

802.11b (Typical):

Test Frequencies	1/2_Target	5.5_Target	11_Target
2412	12	12	12
2437	12	12	12
2472	12	12	12

802.11g (Typical):

Test Frequencies	6-24_Target	36_Target	48_Target	54_Target
2412	15	15	14	14
2437	15	15	14	14
2472	15	15	14	14

802.11n(Typical):

Freq. Range: 5GHz/HT20: @800GI(400GI)

Test Freq	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	15	15	15	15	15	14	12	10
5320	15	15	15	15	15	13	11	9
5825	14	14	14	14	14	10	8	6

Freq. Range: 5GHz/HT40: @800GI(400GI)

Test Freq	MCS 0/8	MCS 1/9	MCS 2/10	MCS 3/11	MCS 4/12	MCS 5/13	MCS 6/14	MCS 7/15
5190	14	14	14	14	14	13	11	9
5510	14	14	14	14	14	11	9	7
5795	13	13	13	13	13	9	7	5

Freq. Range: 2.4GHz/HT20: @800GI(400GI)

Test Freq	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	14	14	14	14	14	14	13	13
2437	14	14	14	14	14	14	13	13
2472	14	14	14	14	14	14	13	13

Freq. Range: 2.4GHz/HT40: @800GI(400GI)

Test Freq	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	12	12	12	12	12	12	11	11
2437	12	12	12	12	12	12	11	11
2472	12	12	12	12	12	12	11	11

Receiver Sensitivity

802.11a:

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
BPSK(6M)	-82	-95/-85
BPSK(9M)	-81	-94/-84
QPSK(12M)	-79	-93/-82
QPSK(18M)	-77	-90/-80
16-QAM(24M)	-74	-88/-77
16-QAM(36M)	-70	-84/-73
64-QAM(48M)	-66	-82/-69
64-QAM(54M)	-65	-81/-68

802.11b:

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
DBPSK(1M)	not specified	-98/-85
DQPSK(5.5M)	not specified	-98/-85
CCK(11M)	not specified	-94/-85

## 802.11g:

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
BPSK(6M)	-82	-96/-85
BPSK(9M)	-81	-96/-84
QPSK(12M)	-79	-95/-82
QPSK(18M)	-77	-93/-80
16-QAM(24M)	-74	-90/-77
16-QAM(36M)	-70	-87/-73
64-QAM(48M)	-66	-83/-69
64-QAM(54M)	-65	-82/-68

## 802.11a/n HT20:

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
BPSK(MCS0)	-82	-94/-85
QPSK(MCS1)	-79	-92/-82
QPSK(MCS2)	-77	-90/-80
16-QAM(MCS3)	-74	-87/-77
16-QAM(MCS4)	-70	-84/-73
64-QAM(MCS5)	-66	-79/-69
64-QAM(MCS6)	-65	-78/-68
64-QAM(MCS7)	-64	-76/-67

## 802.11a/n HT40:

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
PBSK(MCS0)	-79	92/-82
QPSK(MCS1)	-76	-90/-79
QPSK(MCS2)	-74	-87/-77
16-QAM(MCS3)	-71	-84/-74
16-QAM(MCS4)	-67	-80/-70
64-QAM(MCS5)	-63	-76/-66
64-QAM(MCS6)	-62	-74/-65
64-QAM(MCS7)	-61	-72/-64

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**802.11b/g/n HT20:**

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
BPSK(MCS0)	-82	-95/-85
QPSK(MCS1)	-79	-94/-82
QPSK(MCS2)	-77	-92/-80
16-QAM(MCS3)	-74	-89/-77
16-QAM(MCS4)	-70	-86/-73
64-QAM(MCS5)	-66	-82/-69
64-QAM(MCS6)	-65	-80/-68
64-QAM(MCS7)	-64	-78/-67

**802.11b/g/n HT40:**

Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum( 2Rx dBm)
BPSK(MCS0)	-79	-92/-82
QPSK(MCS1)	-76	-92/-79
QPSK(MCS2)	-74	-89/-77
16-QAM(MCS3)	-71	-86/-74
16-QAM(MCS4)	-67	-83/-70
64-QAM(MCS5)	-63	-77/-66
64-QAM(MCS6)	-62	-76/-65
64-QAM(MCS7)	-61	-75/-64

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**Operation  
Distance**

	<b>Outdoor</b>	<b>Indoor</b>
802.11a	50m @ 54Mbps	30m @ 54Mbps
	300m @ 6Mbps	100m @ 6Mbps
802.11b	150m @ 11Mbps	30m @ 11Mbps
	300m @ 1Mbps	100m @ 1Mbps
802.11g	50m @ 54Mbps	30m @ 11Mbps
	300m @ 6Mbps	100m @ 1Mbps
802.11n	30m @ 300Mbps	20m @ 300Mbps
	30m @ 130Mbps	20m @ 130Mbps
	250m @ 6.5Mbps	100m @ 6.5Mbps

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**MAC Protocol**CSMA/CA with ACK architecture 32-bit MAC

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Modulation Technique	DSSS with CCK, DQPSK, DBPSK  OFDM with BPSK, QPSK, 16QAM, 64QAM
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Operation Voltage	3.3V ± 5%
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Security	» 64-bit, 128-bit and 152-bit WEP encryption  » 802.1x authentication  » AES-CCM & TKIP
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Operation Systems Supported	ath9k, Linux, Windows XP, Windows Vista, Windows 7, Windows 8  Atheros Linux SDK sub-license available by project.
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Dimension	26.8 ± 0.1 x 29.85 ± 0.1 x 1.05 ± 0.10mm with 4 PCB layer
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Operation Temperature Range	0°C ~ +60°C ambient
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Storage Temperature Range	-20°C ~ +80°C
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Operating Humidity	15% ~ 95%, non-condensing
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Storage Humidity            max. 95%, non-condensing

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Regulation  
Compliance                Atheros FCC, CE, IC, Telec... etc. [certification status](#)

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Environment-  
Friendly  
Compliance                REACH and RoHS

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Antenna  
Connector                 two Hirose U.FL ultra-miniature coaxial antenna connectors

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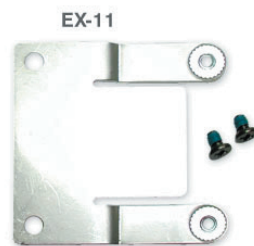
## Ordering Information:

DNXA-116

802.11n a/b/g wifi 2x2 PCIe half-mini card, HB116 / AR9382

EX-11

half size to full size PCIe mini card bracket, 2 mounting screws included.



**Wireless radio modules are ESD sensitive, especially the components such as RF switch and the power amplifier. To avoid damage by electrostatic discharge, the following installation procedure is recommended:**

- » Touch your hands and the bag or tray containing the radio module to a ground point on the host board (for example one of the mounting holes).
- » Install the radio module in the corresponding socket of host board.
- » Install the pigtail cable in the cutout of the enclosure. This will ground the pigtail to the enclosure.
- » Touch the I-PEX connector of the pigtail to the mounting hole (discharge), then plug onto the radio module.
- » Use external lightning protection for outdoor applications.
- » Make sure all antennas are being connected with the radio module (don't leave I-PEX connector open) before powering on the host device.