

Approval Sheet for Model DNMA-92

An IEEE 802.11n a/b/g Mini-PCI module

<Version 1.1>



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V1.0	● Initial Document	2009/09/30
V1.1	Add package specification	2009/10/13

1. Introduction:

- The DNMA-92 is a mini-PCI solution for IEEE 802.11n **a/b/g** wireless LAN card. With 802.11b mode, it provides data rates of 1, 2, 5.5, and 11Mbps, supporting IEEE 802.11b network specification for Direct Sequence Spread Spectrum (DSSS) signaling. With 802.11 g mode, it implements a half-duplex, orthogonal frequency division multiplexing (OFDM) technology supporting all IEEE 802.11g data rates (6 to 54Mbps). 802.11n mode is also provided to support OFDM technology.

➤ **802.11n: @800GI(400GI)**

- **20MHz BW**
 - **1 Nss: 65(72.2)Mbps maximal**
 - **2 Nss: 130(144.444)Mbps maximal**
- **40MHz BW**
 - **1 Nss: 135(150)Mbps maximal**
 - **2 Nss: 270(300)Mbps maximal**

This card is a good solution for users who need mini-PCI 802.11n **a/b/g** WLAN functionality.

1.1. Scope

This document describes the hardware architecture and specification for the DNMA-92.

1.2. Product Features

- ✓ High speed for wireless LAN connection: IEEE802.11b 11Mbps data rate by incorporating Direct Sequence Spread Spectrum (DSSS); IEEE802.11g 54Mbps data rate with OFDM and 11Mbps with DSSS, IEEE802.11n 130Mbps/20MHz BW or 300Mbps/40MHz BW data rate with Orthogonal Frequency Division Multiplexing (OFDM). Provide seamless roaming within the IEEE 802.11n **a/b/g** WLAN infrastructure.
- ✓ Provide seamless roaming within the IEEE 802.11n **a/b/g** WLAN infrastructure
- ✓ IEEE 802.11n **a/b/g** compatible: allowing inter-operation among multiple vendors
- ✓ 64-bit, 128-bit, or 152-bit WEP encryption, set by ASCII and Hexadecimal mode
- ✓ Support AES, and TKIP encryption
- ✓ Smart selection function
- ✓ Mini-PCI host interface
- ✓ Site survey function.
- ✓ Support Microsoft Windows XP, 2000, Vista
- ✓ Interoperability – Complying with WiFi
- ✓ Support WPA

2. Hardware Architecture:

2.1 Hardware Block Diagram

The major internal components and external interfaces of the DNMA-92 are illustrated in Figure 1-1.

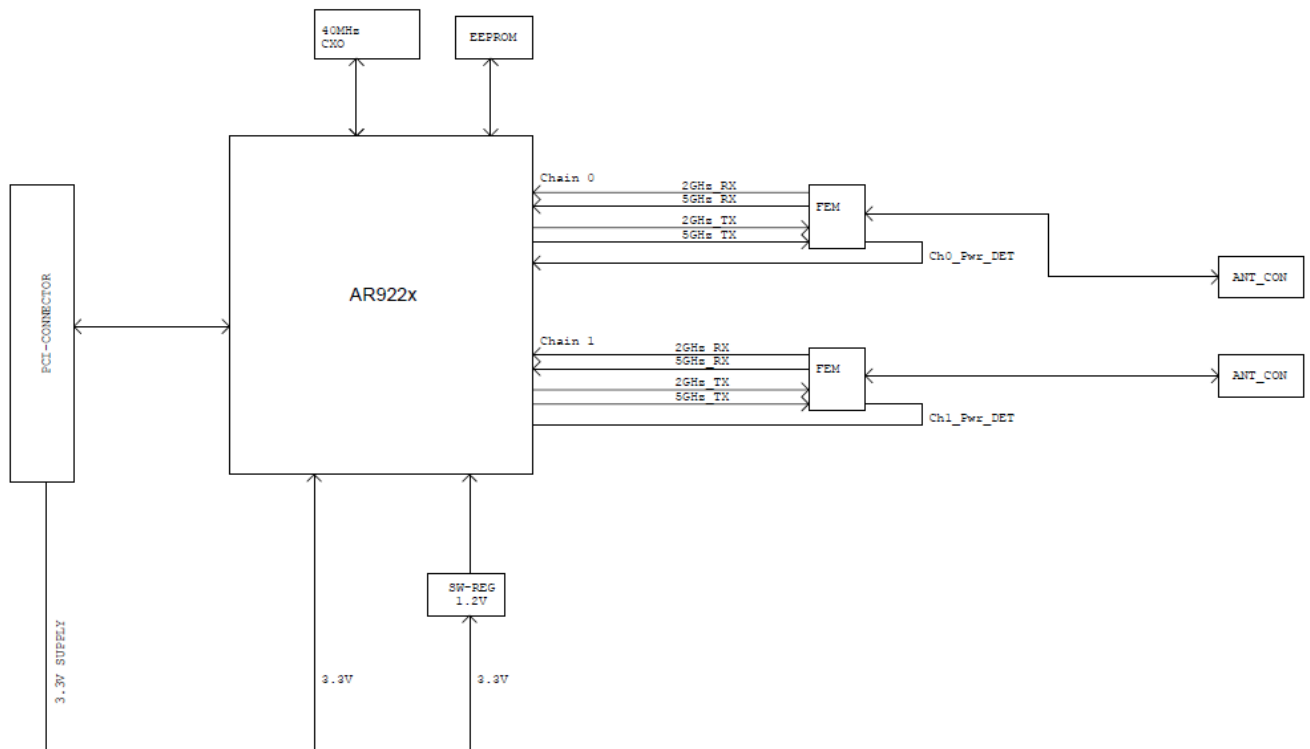


Figure 1-1 DNMA-92 Major Component and System Interface

2.2 Main Chipset Information

Item	Vender	Part number
MAC/BBP/Radio Transceiver	Atheros	AR9220

2.2.1 MAC/Baseband Processor/ Radio Transceiver

The Atheros **AR9220** is a highly integrated single-chip solution for 2.4 and 5 GHz 802.11n- ready wireless local area networks (WLANs) that enables high-performance 2x2 MIMO configurations for wireless station applications demanding robust link quality and maximum throughput and range. The **AR9220** integrates a multi-protocol MAC, baseband processor, analog-to-digital and digital-to-analog (ADC/DAC) converters, 2x2 MIMO radio transceiver, and PCI interface in an all-CMOS device for low power and small form factor applications.

The **AR9220** implements half-duplex OFDM, CCK, and DSSS baseband processing, supporting up to 130 Mbps for 20 MHz and 300 Mbps for 40 MHz channel operations respectively, and IEEE 802.11a/b/g data rates. Additional features include signal detection, automatic gain control, frequency offset estimation, symbol timing, and channel estimation. The **AR9220** MAC supports the 802.11 wireless MAC protocol, 802.11i security, receive and transmit filtering, error recovery, and quality of service (QoS).

The **AR9220** supports two simultaneous traffic streams using up to two integrated transmit chains and receive chains for high throughput and range performance. Transmit chains combine baseband in-phase (I) and quadrature (Q) signals, convert them to the desired frequency, and drive the RF signal to multiple antennas. Receive chains use an integrated architecture that requires no off-chip intermediate frequency (IF) filters. The frequency synthesizer supports one-MHz steps to match frequencies defined by IEEE 802.11a/b/g/n specifications.

The **AR9220** supports frame data transfer to and from the host using a PCI interface that provides interrupt generation and reporting, power save, and status reporting. Other external interfaces include serial EEPROM and GPIOs. The **AR9220** interoperates with standard legacy 802.11a/b/g devices.

2.2.2 Antennas

Three antennas are provided to support MIMO functionality. There are two board to board of RF connectors on board for connecting two chains of RF signals to the well distributed of MIMO antennas.

2.2.3 min-PCI Pin Definition:

Pin Number	Pin Name	Pin I/O Type	Description
1	TIP	NC	No use
2	RING	NC	No use
3	8PMJ-3	NC	No use
4	8PMJ-1	NC	No use
5	8PMJ-6	NC	No use
6	8PMJ-2	NC	No use
7	8PMJ-7	NC	No use
8	8PMJ-4	NC	No use
9	8PMJ-8	NC	No use
10	8PMJ-5	NC	No use
11	LED1_GRNP	General purpose GPIO pin	Connect to AR9220 GPIO1
12	LED2_YELP	General purpose GPIO pin	Connect to AR9220 GPIO2
13	LED1_GRNN	General purpose GPIO pin	Connect to AR9220 GPIO0
14	LED2_YELN	General purpose GPIO pin	Connect to AR9220 GPIO4
15	CHSGND	Ground	Digital Ground
16	RESERVED	NC	Reserved
17	INTB#	NC	No use
18	5V	NC	5V, no use
19	3.3V	Power	3.3V+/-5%
20	INTA#	CMOS, Output	PCI bus Interrupt A
21	RESERVED	NC	Reserved
22	RESERVED	NC	Reserved
23	GROUND	Ground	Digital ground
24	3.3VAUX	NC	No use
25	CLK	Input, Weak pull down	Providing timing for all transactions on the PCI bus
26	RST#	Input, Weak pull up	PCI reset

Pin Number	Pin Name	Pin I/O Type	Description
27	GROUND	Ground	Digital ground
28	3.3V	Power	3.3V+/-5%
29	REQ#	Output	PCI bus request
30	GNT#	Input, Weak pull high	PCI bus grant
31	3.3V	Power	3.3V+/-5%
32	GROUND	Ground	Digital ground
33	AD[31]	BiDir,, Weak pull down	PCI address/data bus bit 31
34	PME#	NC	No use
35	AD[29]	BiDir,, Weak pull down	PCI address/data bus bit 29
36	RESERVED	NC	No use
37	GROUND	Ground	Digital ground
38	AD[30]	BiDir,, Weak pull down	PCI address/data bus bit 30
39	AD[27]	BiDir,, Weak pull down	PCI address/data bus bit 27
40	3.3V	Power	3.3V+/-5%
41	AD[25]	BiDir,, Weak pull down	PCI address/data bus bit 25
42	AD[28]	BiDir,, Weak pull down	PCI address/data bus bit 28
43	RESERVED	NC	No use
44	AD[26]	BiDir,, Weak pull down	PCI address/data bus bit 26
45	C/BE[3]#	BiDir,, Weak pull up	PCI bus commands and byte 3 enables
46	AD[24]	BiDir,, Weak pull down	PCI address/data bus bit 24
47	AD[23]	BiDir,, Weak pull down	PCI address/data bus bit 23
48	IDSEL	Input, Weak pull down	Initialization device select
49	GROUND	Ground	Digital ground
50	GROUND	Ground	Digital ground
51	AD[21]	BiDir,, Weak pull down	PCI address/data bus bit 21
52	AD[22]	BiDir,, Weak pull down	PCI address/data bus bit 22
53	AD[19]	BiDir,, Weak pull down	PCI address/data bus bit 19
54	AD[20]	BiDir,, Weak pull down	PCI address/data bus bit 20

Pin Number	Pin Name	Pin I/O Type	Description
55	GROUND	Ground	Digital ground
56	PAR	BiDir, Weak pull up	PCI bus parity
57	AD[17]	BiDir,, Weak pull down	PCI address/data bus bit 17
58	AD[18]	BiDir,, Weak pull down	PCI address/data bus bit 18
59	C/BE[2]#	BiDir,, Weak pull up	PCI bus commands and byte 2 enables
60	AD[16]	BiDir,, Weak pull down	PCI address/data bus bit 16
61	IRDY#	BiDir,, Weak pull up	PCI initiator ready
62	GROUND	Ground	Digital ground
63	3.3V	Power	3.3V+/-5%
64	FRAME#	BiDir,, Weak pull down	PCI frame.
65	CLKRUN#	Input, Weak pull up	Control signal for PCI clock
66	TRDY#	BiDir,, Weak pull up	PCI target ready
67	SERR#	BiDir, Weak pull up	PCI system error
68	STOP#	BiDir, Weak pull up	PCI cycle stop signal
69	GROUND	Ground	Digital ground
70	3.3V	Power	3.3V+/-5%
71	PERR#	BiDir, Weak pull up	PCI parity error
72	DEVSEL#	BiDir, Weak pull up	PCI device select
73	C/BE[1]#	BiDir, Weak pull down	PCI bus commands and byte 1 enables
74	GROUND	Ground	Digital ground
75	AD[14]	BiDir, Weak pull down	PCI address/data bus bit 14
76	AD[15]	BiDir, Weak pull down	PCI address/data bus bit 15
77	GROUND	Ground	Digital ground
78	AD[13]	BiDir, Weak pull down	PCI address/data bus bit 13
79	AD[12]	BiDir, Weak pull down	PCI address/data bus bit 12
80	AD[11]	BiDir, Weak pull down	PCI address/data bus bit 11
81	AD[10]	BiDir, Weak pull down	PCI address/data bus bit 10

Pin Number	Pin Name	Pin I/O Type	Description
82	GROUND	Ground	Digital ground
83	GROUND	Ground	Digital ground
84	AD[09]	BiDir, Weak pull down	PCI address/data bus bit 9
85	AD[08]	BiDir, Weak pull down	PCI address/data bus bit 8
86	C/BE[0]#	BiDir, Weak pull up	PCI bus commands and byte 0 enables
87	AD[07]	BiDir, Weak pull down	PCI address/data bus bit 7
88	3.3V	Power	3.3V+/-5%
89	3.3V	Power	3.3V+/-5%
90	AD[06]	BiDir, Weak pull down	PCI address/data bus bit 6
91	AD[05]	BiDir, Weak pull down	PCI address/data bus bit 5
92	AD[04]	BiDir, Weak pull down	PCI address/data bus bit 4
93	RESERVED	NC	No use
94	AD[02]	BiDir, Weak pull down	PCI address/data bus bit 2
95	AD[03]	BiDir, Weak pull down	PCI address/data bus bit 3
96	AD[00]	BiDir, Weak pull down	PCI address/data bus bit 0
97	5V	NC	No use
98	RESERVED_WIP4	NC	No use
99	AD[01]	BiDir, Weak pull down	PCI address/data bus bit
100	RESERVED_WIP4	NC	No use
101	GROUND	Ground	Digital ground
102	GROUND	Ground	Digital ground
103	AC_SYNC	NC	No use
104	M66EN	Power	3.3V+/-5%(No use)
105	AC_SDATA_IN	NC	No use
106	AC_SDATA_OUT	NC	No use
107	AC_BIT_CLK	NC	No use
108	AC_CODEEC_ID0#	NC	No use
109	AC_CODEEC_ID1#	NC	No use

Pin Number	Pin Name	Pin I/O Type	Description
110	AC_RESET#	NC	No use
111	MOD_AUDIO_MON	NC	No use
112	RESERVED	NC	No use
113	AUDIO_GND	Ground	Analog ground
114	GROUND	Ground	Digital ground
115	SYS_AUDIO_OUT	NC	No use
116	SYS_AUDIO_IN	NC	No use
117	SYS_AUDIO_OUT GND	NC	No use
118	SYS_AUDIO_IN GND	NC	No use
119	AUDIO_GND	NC	No use
120	AUDIO_GND	Ground	Analog ground
121	RESERVED	NC	Reserved
122	MPCIACT#	NC	Mini PCI function active, no support
123	VCC5VA	NC	No use
124	3.3VAUX	NC	No use

3. Software Specification:

General Function	
Operation System Support	Windows2000, XP, Vista
Network Access Mode	IEEE 802.11n a/b/g Infrastructure Mode
Site Survey	Support Access Points and IEEE 802.11n a/b/g Networks Scanning Capability
Information List	Selected Profile Information, Link Information and TCP/IP Information
Profile	Configuration Name
Network Name (SSID)	This is the name of the IEEE 802.11n a/b/g wireless network
Network Connection	Define if the STA is configured for infrastructure network
Power Saving	Allow the power management options: Off, Normal, and Maximum
Wireless Mode	Specify 802.11n mode, 802.11b/g mode, 802.11a mode, or Auto-Select operation
802.11n Support	For 300Mbps mode
802.11g Support	For 54Mbps mode at 2.4 GHz
QoS	Cooperate in a network using Quality of Service
Country Code Selector	Change Regulatory Domains

Security Setting	
Encryption Type	WEP, AES, and TKIP
Unique Key	Define the unique encryption key for security for the current network configuration
Shared Keys	Define a set of shared encryption keys
Shared Key Length	Full rate 40-bit, 104-bit, and 128-bit WEP encryption and decryption. Full rate 128-bit AES encryption and decryption

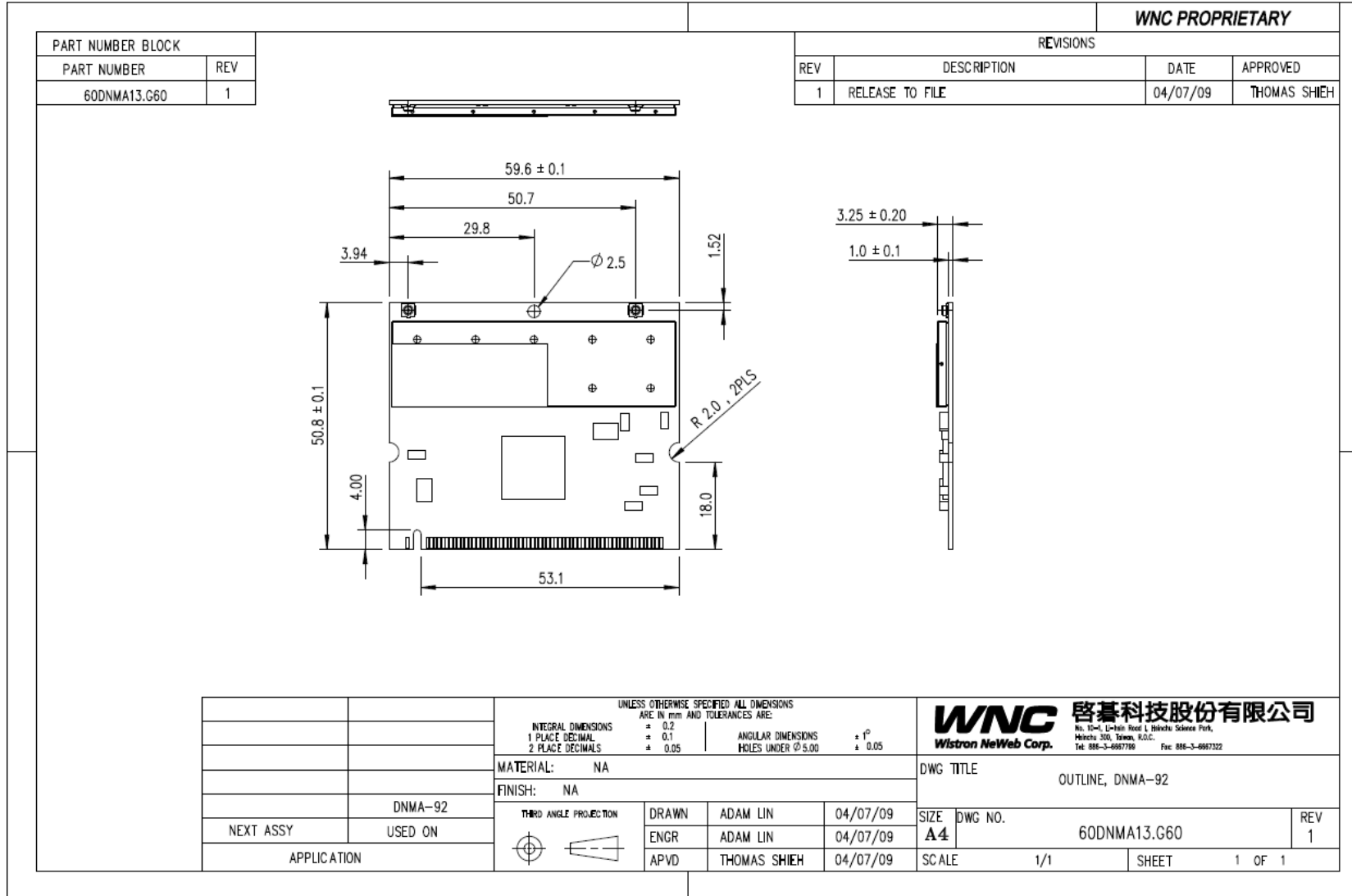
Feature
Smart Select --- Automatically scanning available either 802.11n, 802.11b, 802.11a, or 802.11g Access Point and switching connection by desire
Automatically fall back data rate if signal strength become weakness
Seamless roaming cross 802.11n, 802.11b, 802.11a, and 802.11g Access Point covered distance
Future support 802.11d(Regulatory Domain), 802.11e(Quality of Service), and 802.11h(TPC/DFS) by software upgraded
Automatic data rate and channel selection
Vivid and user-friendly configuration tool
802.11n --- High speed data rate, up to 300Mbps
Wi-Fi / WPA compliant
Support 802.1x authentication, WPA
Support WEP-64, WEP-128, WEP-152 and 128bit AES, and TKIP encryption

4. Bill of Materials List (BOM):

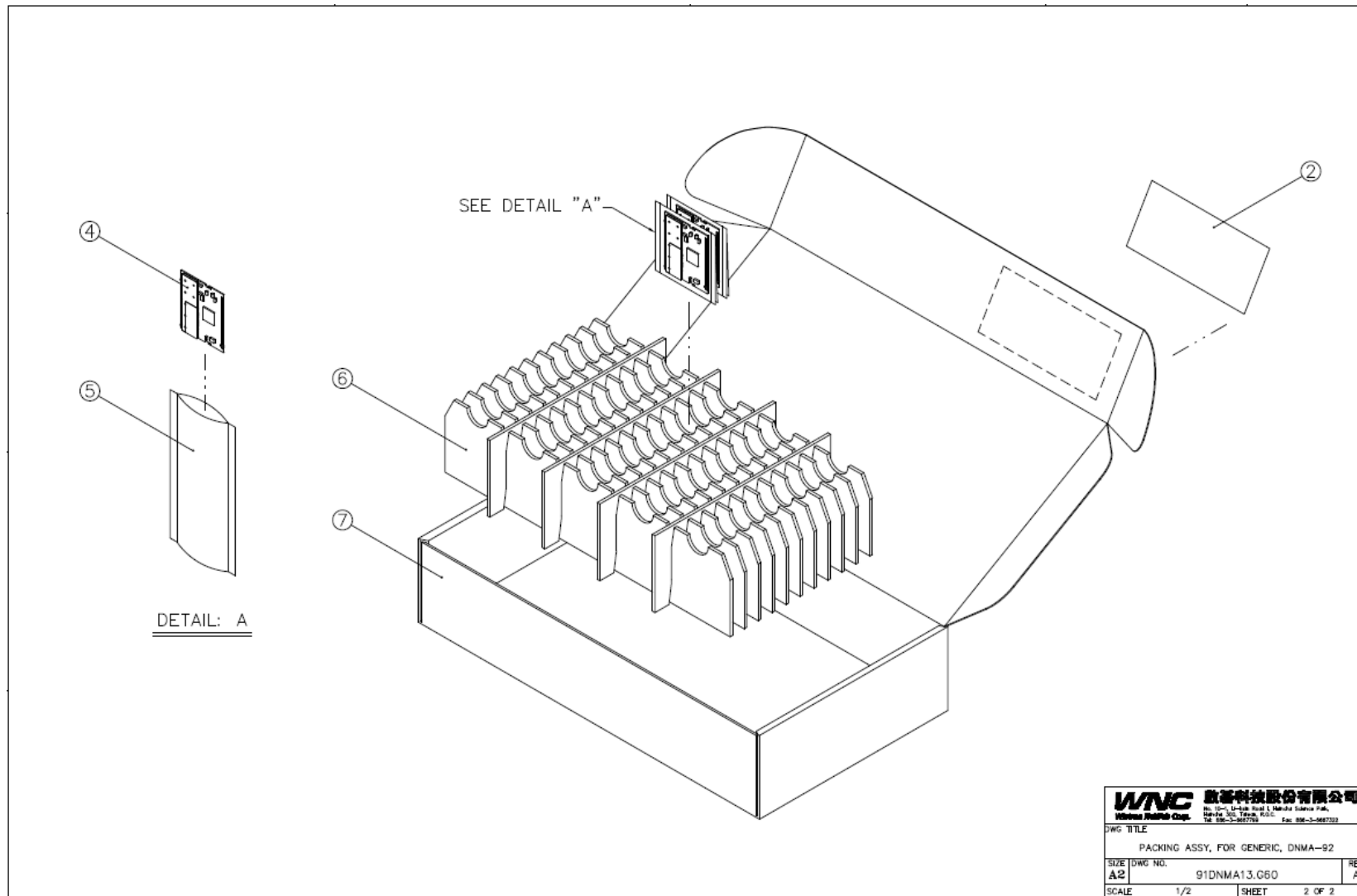
Item	WNC -	Description	Qty	(ID) Location	Mfg.		
1	78.10134.L1J1	CAP,0201,COG,100pF,+/-5%,50V	6	C383(E2),C393(E2),C394(E2),C400(E2),C402(E2),C403(E2)	Murata	GRM0335C1H101JD01D	
2	78.0R574.L04	!CHIP CAP 0.5PF 50V B0402 C1005NPO508BGT	2	C16(B1),C145(B1)			
3	78.0R574.L01AX	*!CHIP CAP 0.5PF 50V C 0402 NPO(MURATA) GRM1555C1HR50C	13	C374(B1),C379(A2),R223(A2),C146(A2),C148(A2),C156(B1),C157(B1),C18(B1),C423(A2),R183(A1),R180(A1),R181(C1),R184(C1)	Murata	GRM1555C1HR50C	
4	78.R75B4.1F1	CAP,0402,NPO,0.75pF,+/-0.1pF,50V	4	C96(A2:B2),C99(A2:B2),C372(B1:B2),C373(B1:B2)	Murata	GJM1555C1HR75BB01D	
5	78.10034.L07	!CHIP CAP 10PF 50V J0402 NPO	3	C3(E2),R202(A1),R209(B1:C1)	1.muRata 2.Darfon	GRM1555C1H100JZ01D	2.C1005NPO100JGT (78.10064.1F1)
6	78.10134.L05AX	CAP,0402,NPO,100pF,+/-5%,50V	14	C370(A1),C371(C1),C382(E2),C395(E2),C396(E2),C397(E2),C398(E2),C404(E2),C405(E2),C406(C2),C407(A2),C408(C2),C410(C2),C412(E2)	MURATA	GRM1555C1H101JZ01D	
7	78.10322.L02	!CHIP CAP 0.01U 25V K0402 X7R GRM155R71C103KA01D	1	C174(C2)	MURATA	GRM155R71C103KA01D	
8	78.10323.5F1	*!CHIP CAP C0.1U 10V K0402 X5R GRM155R61A104KA01D	17	C123(E2),C124(E2),C126(E2),C128(E2),C129(E2),C130(E2),C132(E2),C133(E2),C134(E2),C136(E2),C137(C2),C152(E2),C155(E2),C386(E2),C391(E2),C392(E2),C435(E1)	1.muRata 2.muRata 3.HolyStone	GRM155R61A104KA01D	2.GRM155R61A104KA01D (78.10423.5F1) 3.C0402B104K010T (78.10423.L01)
9	78.15224.2F1	*CHIP CAP C 1500P 50V K0402 XR	1	C139(C2)	Taiyo	UMK105B152KW-F	
10	78.22420.L01AX	CAP,0402,X5R,0.22uF,+/-10%,6.3V	17	C2(C2),C117(E2),C118(E2),C121(E2),C122(E2),C142(A2),C153(A2),C154(A2),C159(C2),C378(E2),C381(E2),C384(E1:E2),C388(E2),C389(E2),C390(E2),C409(E2)	Murata	GRM155R60J224K	
11	78.2R274.L04	*CHIP CAPACITOR CERAMIC 2.2PF 50V C0402 NPO(DARFON)	2	C34(B1),C97(A2)	Darfon	C1005NPO229CGT	
12	78.33034.1F1	*CHIP CAP NPO 33PF 50V J 0402 C1005NPO330JGT	2	C427(A2),C428(B1)	Darfon	C1005NPO330JGT	
13	78.3R974.L02	*G6 CHIP CAPACITOR CERAMIC 3.9PF 50V C0402 NPO (DARFO)	4	C375(B1:B2),C376(B1:B2),C377(A2:B2),C380(A2:B2)	Darfon	C1005NPO399CGT	
14	78.47034.L04AX	CHIP CAP 47PF 50V J 0402 NPO GRM1555C1H470JZ01D	8	C41(B1),C102(E1),C103(B1),C104(E1),C105(A1),C106(C1),C429(E1),C432(E1)	murata	GRM1555C1H470JZ01D	
15	78.8R274.1FA	G6 CHIP CAP 8.2PF 50V C1005NPO829CGT	2	R222(A2),R225(B1)	Darfon	C1005NPO829CGT	
16	78.47523.L04	CHIP CERAMIC CAPACITORS X5R,10V,SMT,4.7UF,K,0603,C1608X5R475KDT	2	C91(A1),C424(C1)	Darfon	C1608X5R475KDT	
17	78.22521.L03	CHIP CAP 2.2UF DC16V K0805 X5R C2012X5R1C225KT	1	C168(C2)	TDK	C2012X5R1C225KT	
18	78.22523.L03	CHIP CAP 2.2UF DC10V K0805 X7R C2012X7R1A225KT	1	C422(C2)	TDK	C2012X7R1A225KT	
19	78.22620.511	CHIP CAP 22UF X5R K 6.3V 1206 GRM31CR60J226K	4	C86(C2),C149(C2),C150(C2),C151(A2)	1.muRata 2.TDK	GRM31CR60J226K	2.C3216X5R0J226M (78.22610.52A)
20	78.47610.5E1	CHIP CAP 47UF 1206 X5R 6.3V JMK316BJ476ML-T	2	C167(C1),C169(C1:C2)	TAYIO	JMK316BJ476ML-T	
21	63.R0034.1D1	CHIP RES 0 J 1/16W 0402	15	R216(A1),R218(C1),R235(E2),R236(E2),R237(E1:E2),R238(E1:E2),R243(B2),R250(B2),L36(B1),L37(A2),L43(B1),L44(A1),L45(A2),L46(B1),R196(E2)	1.大毅(TA-I) 2.國巨(YAGEO)	RM04JTN0 RC0402RJ-070R	
22	64.10R05.L06	RES,0402,10 OHMS,+/-1%,1/16W	1	R194(E1:E2)	TA-I	RM04FTN10R0	
23	64.10025.6D1	CHIP RES 10K F 1/16W 0402	10	R11(A2),R12(A2),R78(C2),R79(C2),R101(E1),R102(B1),R103(E1),R106(B1),R233(B1:B2),R234(B1:B2)	1.大毅(TA-I) 2.國巨(YAGEO)	RM04FT1002	
24	63.18034.1D1	RES,0402,18 OHMS,+/-5%,1/16W	2	R162(C2),R163(C2)	TA-1	RM04JTN180	
25	64.22R05.6D1	CHIP RES 22OHM F0402 1/16W RM04FTN22R0	8	R39(E1),R40(B1),R41(A1),R42(C1),R43(E1),R48(E1),R50(E1),R212(B1)	TA-I	RM04FTN22R0	
26	63.51134.L02AX	RES,0402,510 OHMS,+/-5%,1/16W	2	R177(E1),R182(E1)	TA-1	RM04JTN511	
27	64.61915.L03	!CHIP RES 6.19K F 1/16W 0402	1	R16(E1:E2)	TA-I	RM04FTN6191	
28	63.R0004.151	*!R6 CHIP RES 0 J 1/10W 0603	3	R31(C2),R178(C2),R200(A2)	TA-I	RM06JTN0	
29	68.1R5AN.1R1	*CHIP INDUCTOR 1.5NH B 0402 LQP15MN1N5B02D	4	L29(B1),L30(A2),R229(B1),R230(A2)	Murata	LQP15MN1N5B02D	
30	68.1R86N.1RC	*!CHIP INDUCTOR 1.8NH +/-0.3NH 0402 LQG15HN1N8S02D	2	L38(B1),L39(A2)	Murata	LQG15HN1N8S02D	
31	68.2R210.121	FIXED COIL,SMT,2.2UH,1210,LQH32CN2R2M53K	1	L18(C2)	Murata	LQH32CN2R2M53K	

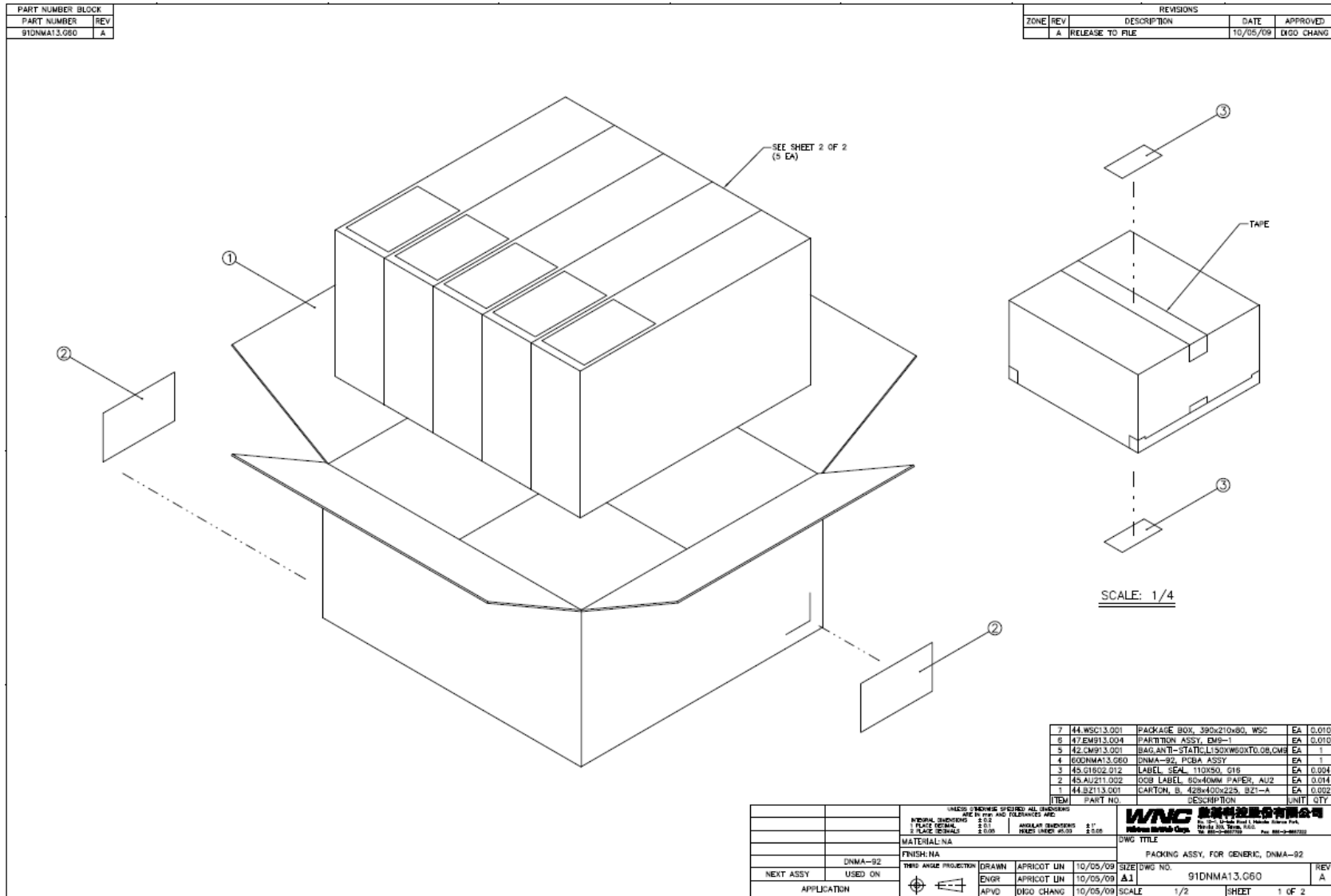
Item	WNC -	Description	Qty	(ID) Location	Mfg.		
32	71.92201.A0U	AR9220.802.11n.2x2.MIMO MAC/BB/RADIO.2.4 AND 5GHz WLAN,BGA	1	U6(B2)	Atheros	AR9220-AC1A	
33	82.20041.111	XTAL,TCXO,SM,40MHz,1.8V,+/-20PPM	1	Y4(C1;C2)	TXC	7C40000281	
34	72.24C32.A0F	IIC EEPROM 32KBIT M24C32-WMN6TP	1	U2(A2)	1.STMicro 2.Atmel	M24C32WMN6TP	AT24C32AN-10SU-2.7 (72.24C32.00F)
35	21.90004.003	COAXIAL CONN,SMT,3 PIN,AM4 1000 000 3	2	J2(A1),J3(C1)	splink	AM4-1000-000-3	
36	56.21DNM.031	FRONT END MODULE,11AG POWER 22DBM NF 2.6DB,SE2593A20-T	2	U13(A1),U14(C1)	Sige Semicondu	SE2593A	
37	69.F1608.001	RF_SPEC,BALUN,THIN FILM, 2.45 GHz, 50-100 OHM	2	F10(A2),F11(B1)	Cyntec	TBL-1608-245-L2	
38	74.08010.040	IC PWM VOTAGE CONVERTER,SMT,WDFN,6,RT8010PQW	1	VR1(C2)	RichTek	RT8010-PQW	
39	74.08805.F38	VOLTAGE REGULATOR IC,SMT,SOT-89,3 PIN,AME88052EFTZ	1	VR2(C1;C2)	AME Inc	AME88052EFTZ	
40	34DNMA92.001	SHIELD,RF SHIELD FRAME, MB91/MB92	1	X4	HunPai	298-05839-000	
41	34DNMA92.011	SHIELD,RF,Shield Cover for MB91/MB92	1	X3	HunPai	298-05839-100	
42	48DNMA06.0GA	PCB	1				
43	68.2R70N.2R1	ICCHIP COIL 2.7NH +/-0.1NH 0402 LQP15MN2N7B02D	2	C7(B1),C24(A2;B2),	Murata	LQP15MN2N7B02D	
44	68.3R3AN.1R1	*ICCHIP IND 3.3NH B 0402 LQP15MN3N3B02D	2	L19(B2),L35(B2)	Murata	LQP15MN3N3B02D	
45	78.1R574.L05	CHIP CAPACITOR NPO 1.5PF 50V C 0402 C1005NP0159CGT	2	C144(A2;B2),C15(A2;B2)	DARFON	C1005NP0159CGT	
46	69.10067.081	*ICCHIP FILTER BPF LFB215G37SG8	2	F6(A1;A2),F7(B1)	Murata	LFB215G37SG8A185	
47	78.0R2B4.L01	CERAMIC CAPACITORS NPO,50V,SMT,0.2PF,B,0402,C1005NP0208BGT	2	R201(A1),R204(C1)	DARFON	C1005NP0208BGT	
48	68.1R0AN.1R1	*ICCHIP IND 1NH B 0402 LQP15MN1N0B00D	2	C108(A1),C135(C1)	Murata	LQP15MN1N0B00D	

5. Outline dimension:



6. Packing Specification:



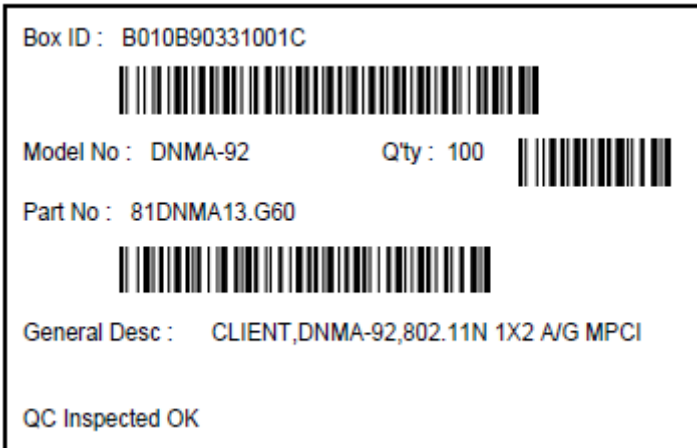


7. Label Specification:

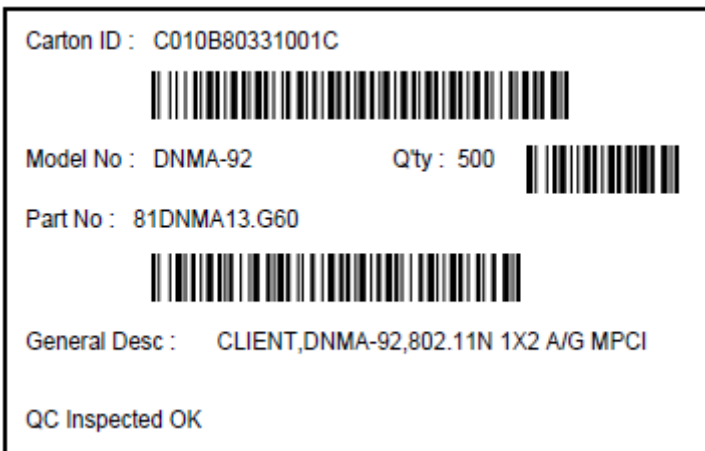
SN:



Box:



Carton:



FCC:



8. Specifications:

Category	Key Specifications					
Main Chipset	<ul style="list-style-type: none"> Atheros® Communication AR9220 dual band configurable radio 					
Frequency Range	<ul style="list-style-type: none"> USA: 2.400 ~ 2.483 GHz, 5.15 ~ 5.35 GHz, 5.5 ~ 5.7 GHz, 5.725 ~ 5.825 GHz Europe: 2.400 ~ 2.483 GHz, 5.15 ~ 5.35 GHz, 5.47 ~ 5.725 GHz Japan: 2.400 ~ 2.497 GHz, 5.15 ~ 5.35 GHz, 5.47 ~ 5.725 GHz China: 2.400 ~ 2.483 GHz, 5.725 ~ 5.85 GHz <p><i>(Note: A DNMA-92 radio is capable to be operated within FCC DFS2 band or ETSI/EC DFS band, or other countries which is regulating or is planning to regulate mid-5 GHz band. The usage of mid-5 GHz band is subject to the regulatory approval alone with the resided devices like Access Point or Router.)</i></p>					
Host Interface	<ul style="list-style-type: none"> Mini-PCI form factor; Mini-PCI Version 1.0 type 3A 					
Channels support	<ul style="list-style-type: none"> 802.11 b/g/n <ul style="list-style-type: none"> US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14th), 11g/n: 13 (1 ~ 13) China: 13 (1 ~ 13) 802.11 a/n <ul style="list-style-type: none"> US/Canada: 23 non-overlapping channels; 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161 Europe: 19 non-overlapping channel; 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140 Japan: 19 non-overlapping channels; 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140 China: 5 non-overlapping channels; 149, 153, 157, 161, 165 					
Operation Voltage	<ul style="list-style-type: none"> 3.3V +/-5% 					
Typical Current Consumption		802.11a	802.11b	802.11g	802.11n(2.4GHz)	802.11n(5GHz)
		Avg/Max (mA)	Avg/Max (mA)	Avg/Max (mA)	Avg/Max (mA)	Avg/Max (mA)
	Continue Tx	617/744	566/691	706/859	579/712	591/720
	FTP Tx	356/667	363/700	271/743	358/741	379/761
	FTP Rx	224/590	156/685	165/721	184/726	287/707
	Standby mode	180/312	142/254	143/259	142/256	205/325
	The maximum current consumption would be impacted by radiation environment and the driver n					
	Condition: 2T2R @25° C (with +15 /-15% tolerance)					

RF Output Power (dB) (Typical composite power) Tolerance: +2/-2 dB @ 25 °C +3/-3 dB @ 0 & 60 °C	<u>802.11a</u>								
	Frequency		6-24_Target	36_Target	48_Target	54_Target			
	5180		21	20	19	17			
	5320		21	20	19	17			
	5700		21	20	19	16			
	5825		21	20	19	16			
	<u>802.11b</u>								
	Frequency		1_Target	2_Target	5.5_Target	11_Target			
	2412		20	21	21	21			
	2484		19	20	21	21			
<u>802.11g</u>									
Frequency		6-24_Target	36_Target	48_Target	54_Target				
2412		23	22	21	19				
2442		23	22	21	19				
2472		23	22	21	19				
<u>802.11a/n</u>									
<u>Freq. Range: 5GHz/HT20:</u>									
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		21	21	21	20	20	20	19	16
5240		21	21	21	20	20	20	19	15
5320		21	21	21	20	20	20	19	14
5500		20	20	20	20	20	20	19	14
5700		19	19	19	19	19	19	18	14
5745		19	19	19	19	19	19	18	14
5825		19	19	19	19	19	19	18	14
<u>Freq. Range: 5GHz/HT40:</u>									
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
5190		19	19	19	19	19	19	18	13
5230		19	19	19	19	19	19	18	13
5270		19	19	19	19	19	19	18	13
5510		18	18	18	18	18	18	18	13
5670		18	18	18	18	18	18	17	13
5755		18	18	18	18	18	18	17	13
5795		18	18	18	18	18	18	17	13
<u>802.11gn</u>									
<u>Freq. Range: 2GHz/HT20:</u>									
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		21	21	21	21	21	21	19	17
2442		21	21	21	21	21	21	19	17
2472		21	21	21	21	21	21	19	17
<u>Freq. Range: 2GHz/HT40:</u>									
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
2422		21	21	21	21	20	20	18	16
2442		20	20	20	20	20	20	18	16
2462		20	20	20	20	19	19	18	16

EVM

802.11a

Data Rate	Relative constellation error (dB) IEEE Spec (1Tx)	Relative constellation error (dB) Typical/Maximum (2Tx)
6M	-5	-25/-16
9M	-8	-25/-16
12M	-10	-25/-16
18M	-13	-26/-16
24M	-16	-24/-19
36M	-19	-27/-22
48M	-22	-28/-23
54M	-25	-28/-25

802.11b

Data Rate	Relative constellation error (dB) IEEE Spec (1Tx)	Relative constellation error (dB) Typical/Maximum (2Tx)
1M	-10	-18/-15
5.5M	-10	-18/-15
11M	-10	-18/-15

802.11g

Data Rate	Relative constellation error (dB) IEEE Spec (1Tx)	Relative constellation error (dB) Typical/Maximum (2Tx)
6M	-5	-24/-16
9M	-8	-25/-16
12M	-10	-25/-16
18M	-13	-26/-16
24M	-16	-23/-19
36M	-19	-29/-22
48M	-22	-31/-23
54M	-25	-31/-25

802.11ng

Data Rate	Relative constellation error (dB) IEEE Spec (1Tx)	Relative constellation error (dB) Typical/Maximum (2Tx)
HT20		
MCS0	-5	-30/-16
MCS1	-10	-30/-16
MCS2	-13	-30/-16
MCS3	-16	-30/-19
MCS4	-19	-30/-22
MCS5	-22	-31/-23
MCS6	-25	-31/-25
MCS7	-28	-31/-26
MCS8	-5	-30/-16
MCS9	-10	-30/-16
MCS10	-13	-30/-16
MCS11	-16	-30/-19
MCS12	-19	-30/-22
MCS13	-22	-30/-23
MCS14	-25	-30/-25
MCS15	-28	-30/-26

HT40

MCS0	-5	-30/-16
MCS1	-10	-30/-16
MCS2	-13	-30/-16
MCS3	-16	-30/-19
MCS4	-19	-30/-22
MCS5	-22	-30/-23
MCS6	-25	-30/-25
MCS7	-28	-30/-26
MCS8	-5	-30/-16
MCS9	-10	-30/-16
MCS10	-13	-30/-16
MCS11	-16	-30/-19
MCS12	-19	-30/-22
MCS13	-22	-30/-23
MCS14	-25	-30/-25
MCS15	-28	-30/-26

802.11na

Data Rate	Relative constellation error (dB)	Relative constellation error (dB)
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Sensitivity	802.11a		
	Data Rate	IEEE Spec (1 Rx dBm)	Typical/Maximum (2 Rx dBm)
	6M	-82	-95/-91
	9M	-81	-95/-91
	12M	-79	-94/-90
	18M	-77	-92/-88
	24M	-74	-88/-84
	36M	-70	-85/-81
	48M	-66	-81/-77
	54M	-65	-79/-75
	802.11b		
	Data Rate	IEEE Spec (1 Rx dBm)	Typical/Maximum (2 Rx dBm)
	1M	-82	-95/-91
	5.5M	-80	-95/-91
	11M	-76	-91/-87
	802.11g		
	Data Rate	IEEE Spec (1 Rx dBm)	Typical/Maximum (2 Rx dBm)
	6M	-82	-95/-91
	9M	-81	-95/-91
	12M	-79	-94/-90
	18M	-77	-93/-89
	24M	-74	-90/-86
	36M	-70	-86/-82
	48M	-66	-82/-78
	54M	-65	-80/-76
	802.11ng		
	Data Rate	IEEE Spec (1 Rx dBm)	Typical/Maximum (2 Rx dBm)
	HT20		
	MCS0	-82	-95/-91
	MCS1	-79	-94/-90
	MCS2	-77	-92/-88
	MCS3	-74	-88/-84
	MCS4	-70	-85/-81
	MCS5	-66	-80/-76
	MCS6	-65	-79/-75
	MCS7	-64	-77/-73
	HT40		
	MCS0	-79	-90/-86
	MCS1	-76	-90/-86
	MCS2	-74	-89/-85
	MCS3	-71	-85/-81
	MCS4	-67	-82/-78
	MCS5	-63	-78/-74
	MCS6	-62	-77/-73
	MCS7	-61	-74/-71

	<p>802.11na</p> <table border="1"> <thead> <tr> <th data-bbox="411 293 485 322">Data Rate</th> <th data-bbox="711 293 932 322">IEEE Spec (1 Rx dBm)</th> <th data-bbox="1066 293 1356 322">Typical/Maximum(2 Rx dBm)</th> </tr> </thead> <tbody> <tr> <td colspan="3" data-bbox="411 331 485 360">HT20</td> </tr> <tr> <td data-bbox="485 376 555 405">MCS0</td> <td data-bbox="804 376 842 405">-82</td> <td data-bbox="1177 376 1248 405">-95/-91</td> </tr> <tr> <td data-bbox="485 414 555 443">MCS1</td> <td data-bbox="804 414 842 443">-79</td> <td data-bbox="1177 414 1248 443">-93/-89</td> </tr> <tr> <td data-bbox="485 452 555 481">MCS2</td> <td data-bbox="804 452 842 481">-77</td> <td data-bbox="1177 452 1248 481">-90/-86</td> </tr> <tr> <td data-bbox="485 490 555 519">MCS3</td> <td data-bbox="804 490 842 519">-74</td> <td data-bbox="1177 490 1248 519">-87/-83</td> </tr> <tr> <td data-bbox="485 528 555 557">MCS4</td> <td data-bbox="804 528 842 557">-70</td> <td data-bbox="1177 528 1248 557">-84/-80</td> </tr> <tr> <td data-bbox="485 566 555 595">MCS5</td> <td data-bbox="804 566 842 595">-66</td> <td data-bbox="1177 566 1248 595">-80/-76</td> </tr> <tr> <td data-bbox="485 604 555 633">MCS6</td> <td data-bbox="804 604 842 633">-65</td> <td data-bbox="1177 604 1248 633">-79/-75</td> </tr> <tr> <td data-bbox="485 642 555 672">MCS7</td> <td data-bbox="804 642 842 672">-64</td> <td data-bbox="1177 642 1248 672">-77/-73</td> </tr> <tr> <td colspan="3" data-bbox="411 723 485 752">HT40</td> </tr> <tr> <td data-bbox="485 768 555 797">MCS0</td> <td data-bbox="804 768 842 797">-79</td> <td data-bbox="1177 768 1248 797">-91/-87</td> </tr> <tr> <td data-bbox="485 806 555 835">MCS1</td> <td data-bbox="804 806 842 835">-76</td> <td data-bbox="1177 806 1248 835">-90/-86</td> </tr> <tr> <td data-bbox="485 844 555 873">MCS2</td> <td data-bbox="804 844 842 873">-74</td> <td data-bbox="1177 844 1248 873">-87/-83</td> </tr> <tr> <td data-bbox="485 882 555 911">MCS3</td> <td data-bbox="804 882 842 911">-71</td> <td data-bbox="1177 882 1248 911">-84/-80</td> </tr> <tr> <td data-bbox="485 920 555 949">MCS4</td> <td data-bbox="804 920 842 949">-67</td> <td data-bbox="1177 920 1248 949">-82/-78</td> </tr> <tr> <td data-bbox="485 958 555 987">MCS5</td> <td data-bbox="804 958 842 987">-63</td> <td data-bbox="1177 958 1248 987">-78/-74</td> </tr> <tr> <td data-bbox="485 996 555 1025">MCS6</td> <td data-bbox="804 996 842 1025">-62</td> <td data-bbox="1177 996 1248 1025">-76/-72</td> </tr> <tr> <td data-bbox="485 1034 555 1064">MCS7</td> <td data-bbox="804 1034 842 1064">-61</td> <td data-bbox="1177 1034 1248 1064">-74/-70</td> </tr> </tbody> </table>	Data Rate	IEEE Spec (1 Rx dBm)	Typical/Maximum(2 Rx dBm)	HT20			MCS0	-82	-95/-91	MCS1	-79	-93/-89	MCS2	-77	-90/-86	MCS3	-74	-87/-83	MCS4	-70	-84/-80	MCS5	-66	-80/-76	MCS6	-65	-79/-75	MCS7	-64	-77/-73	HT40			MCS0	-79	-91/-87	MCS1	-76	-90/-86	MCS2	-74	-87/-83	MCS3	-71	-84/-80	MCS4	-67	-82/-78	MCS5	-63	-78/-74	MCS6	-62	-76/-72	MCS7	-61	-74/-70
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<p>Operation Distance</p>	<ul style="list-style-type: none"> ▪ 802.11a <ul style="list-style-type: none"> ○ Outdoor: 50 m @54Mbps, 300 m @6Mbps ○ Indoor: 30 m @54Mbps, 100 m @6Mbps ▪ 802.11b <ul style="list-style-type: none"> ○ Outdoor: 150 m @11Mbps, 300 m @1Mbps ○ Indoor: 30 m @11Mbps, 100 m @1Mbps ▪ 802.11g <ul style="list-style-type: none"> ○ Outdoor: 50 m @54Mbps, 300 m @6Mbps ○ Indoor: 30 m @54Mbps, 100 m @6Mbps ▪ 802.11n <ul style="list-style-type: none"> ○ Outdoor: 250 m @6.5Mbps (MCS0: 1 Nss/20MHz BW) ○ 30m @130Mbps (MCS15: 2 Nss/20MHz BW) ○ 30m @300Mbps (MCS15: 2 Nss/40MHz BW) ○ Indoor: 100 m @6.5Mbps (MCS0: 1 Nss/20MHz BW) ○ 20m @130Mbps (MCS15: 2 Nss/20MHz BW) ○ 20m @300Mbps (MCS15: 2 Nss/40MHz BW) <p>(Notes :Estimated range are based on 2dB dipole antenna. The real operational distance is depending on (Access Point) system efficiency and antenna performance.)</p>																																																									

PCB Dimension	<ul style="list-style-type: none"> ▪ 50.8mm (L/H) x 59.6mm (W) x 1.0mm (T)
Data Rate	<ul style="list-style-type: none"> ▪ 802.11b: 1, 2, 5.5, 11Mbps ▪ 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps ▪ 802.11n: @800GI(400GI) <ul style="list-style-type: none"> ○ 20MHz BW <ul style="list-style-type: none"> ▪ 1 Nss: 65(72.2)Mbps maximal ▪ 2 Nss: 130(144.4)Mbps maximal ○ 40MHz BW <ul style="list-style-type: none"> ▪ 1 Nss: 135(150)Mbps maximal ▪ 2 Nss: 270(300)Mbps maximal
Operation Temperature	<ul style="list-style-type: none"> ▪ 0° ~ 60° C
Storage Temperature	<ul style="list-style-type: none"> ▪ -20° ~ 80° C
Wi-Fi® Alliance®	<ul style="list-style-type: none"> ▪ WECA Compliant
Radio & EMC Certificate	<ul style="list-style-type: none"> ▪ US: 47 CFR 15, FCC Part 15.401~ Part 15.407 (5150 ~ 5350 MHz & 5725~5825 MHz), Part 15.247 (5725~5850 MHz); FCC Part 15.247 (2400~2483.5 MHz), 47CFR 15, FCC-Class B, FCC Part 15.107 & Part 15.109; ▪ Limited Module Level Approval, ▪ Industry Canada: IC RSS210, RSS139-1, ICES-003; Limited Module Level Approval ▪ ETSI, EN301893, EN60950 (Europe); EN 301.893, EN 300.328, & EN 301489-1/17 EN 55022 & EN 55024;
Antenna connector	<ul style="list-style-type: none"> ▪ 2 x SMT ultra-miniature coaxial connectors (Hirose® U.FL connector)

Note: