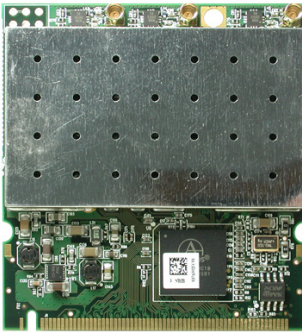




Industrial-grade, high-power 802.11n a/b/g wifi 3x3 mini-PCI module w/ESD and Surge Protection, AR9160-BC1B+AR9106



Model: DNMA-H5



DNMA-H5 is an industrial-grade, high-power 802.11n a/b/g wifi 3x3 mini-PCI module designed specifically to enable highest performance, reliability, and durability in the harshest temperature range of $-40^{\circ}\text{C} \sim +75^{\circ}\text{C}$.

Unique Rx filter design and power control accuracy in $-40^{\circ}\text{C} \sim +75^{\circ}\text{C}$ temperature range can dramatically reduce wifi interference to improve the data throughput and range performance in con-current 2.4 & 5GHz applications and high-density outdoor hot-spot deployments.

RF ESD/Surge protection up to 10KV ensures highest levels of performance and reliability in the harshest outdoor environment such as mesh networking, military, bridging, and infrastructure applications.

Atheros AR9160-BC1B industrial grade chipset supports 2 simultaneous traffic MIMO streams using up to 3 integrated Tx and Rx for high throughput and range performance.

Key Features:

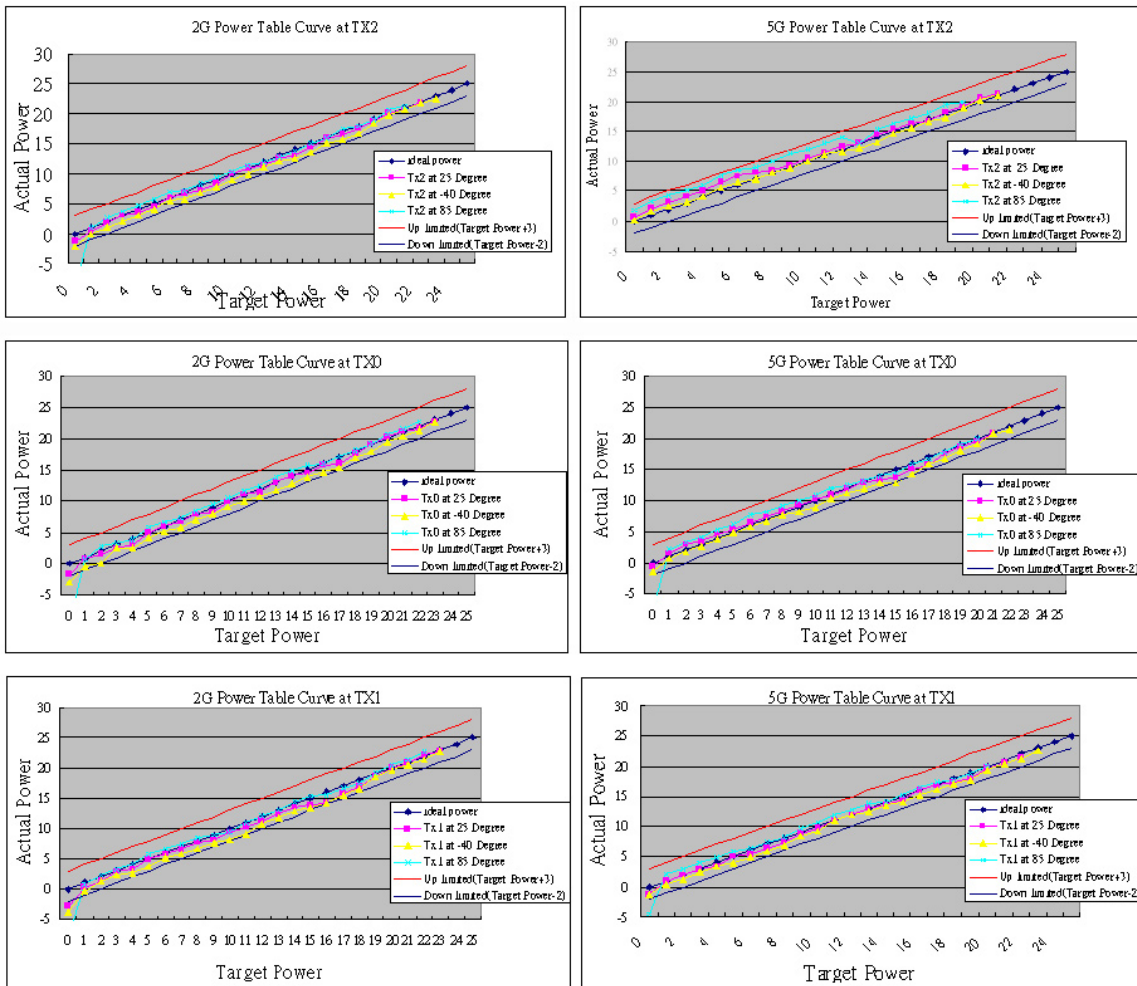
- Rx filter design and accurate power controls in $-40^{\circ}\text{C} \sim +75^{\circ}\text{C}$ temperature range can dramatically reduce wifi interference to improve the data throughput and range performance in con-current 2.4 & 5GHz applications and high-density outdoor hot-spot deployments.
- RF ESD and Surge protection up to 10KV ensure highest levels of performance and reliability in the harshest outdoor mesh or military deployments.
- Industrial grade AR9160-BC1B chipset ensures reliability and durability in $-40^{\circ}\text{C} \sim +75^{\circ}\text{C}$ range for rugged devices.
- High RF power up to 400mW (26dBm) @ 5GHz and 600mW (28dBm) @ 2.4GHz provides superior wifi coverage.
- PA fine-tuning gains balance of linearity and power consumption with enough margin while maintaining adequate Tx power to ensure no major performance degradation over time.
- 3~5dBi Tx linearity improvement than standard MB82 reference design.
- Same EVM on both light and heavy loading maintain lower packet error to increase channel efficiency.
- 3.3Vdc+5.0Vdc dual power supply design (5Vdc from mini-PCI interface pin18 & pin 97 per mini-PCI standard) enables high power application in limited PCB size.
- Mini-PCI Type IIIA form factor (length is 15mm longer than IIIA type) with screw hole is ideal for solid mounting onto motherboard.
- Dual band 802.11 a/b/g/n support 3Tx/3Rx to enable data rate up to 300Mbps link rate for 40MHz channel, six times the throughput of 802.11a and 802.11g.
- Supported by ath9k providing Linux kernel AP/Station/IBSS/Monitor/Mesh/WDS-mode drivers for industrial, academic, or personal projects at highest flexibility and lowest cost.
- Atheros Linux SDK for AP and client-mode sub-license available by project.
- Supports 64/128/152-bit WEP encryption, IEEE 802.1x authentication, AES & TKIP, and CCX3.0 encryption.
- Heat sink design provides reliable high power RF performance.
- Three DIP type MMCX RF connector enables robust assembly and lower loss for external antenna.
- RoHS compliance meets environment-friendly requirement.

Why AR9160-BC1B industrial grade chipset required?

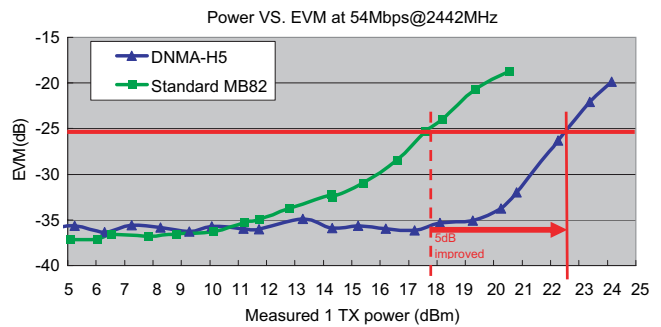
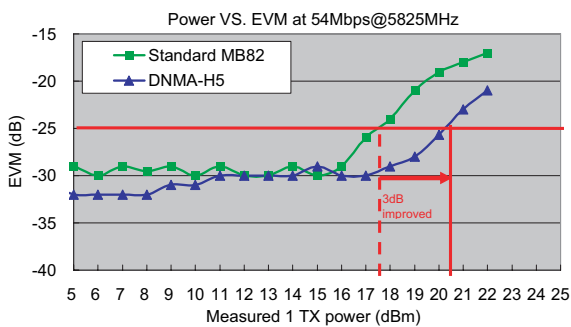


Industrial grade AR9160-BC1B chipset is for applications in the most-demanding environments in the world. It must withstand tremendous temperature, humidity, and ambient air ranges. By contrast, the commercial grade AR9160-BC1A is for applications generally placed in a climate-controlled environment that is carefully monitored to ensure optimum performance.

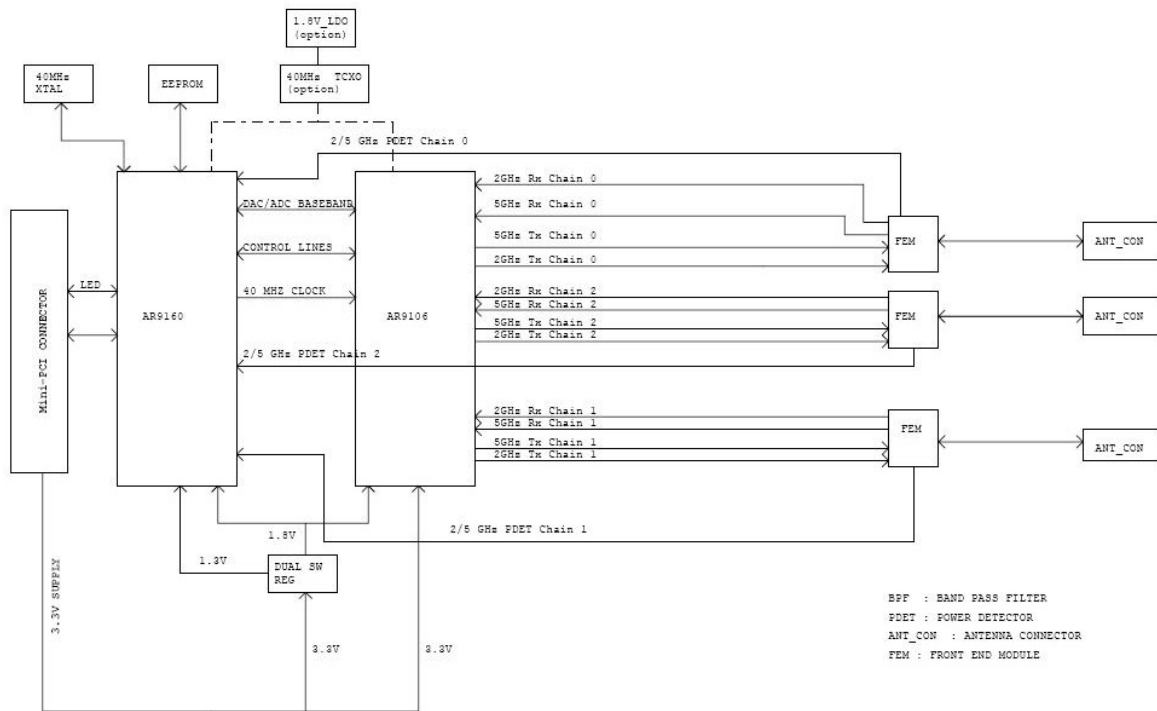
Power control accuracy reaches 1dBm in temperature range -40~ +75°C which dramatically improves the data throughput and range performance in high-density enterprise and commercial hot-spot deployments with high-gain antenna.



Tx power improvement than standard MB82 reference design

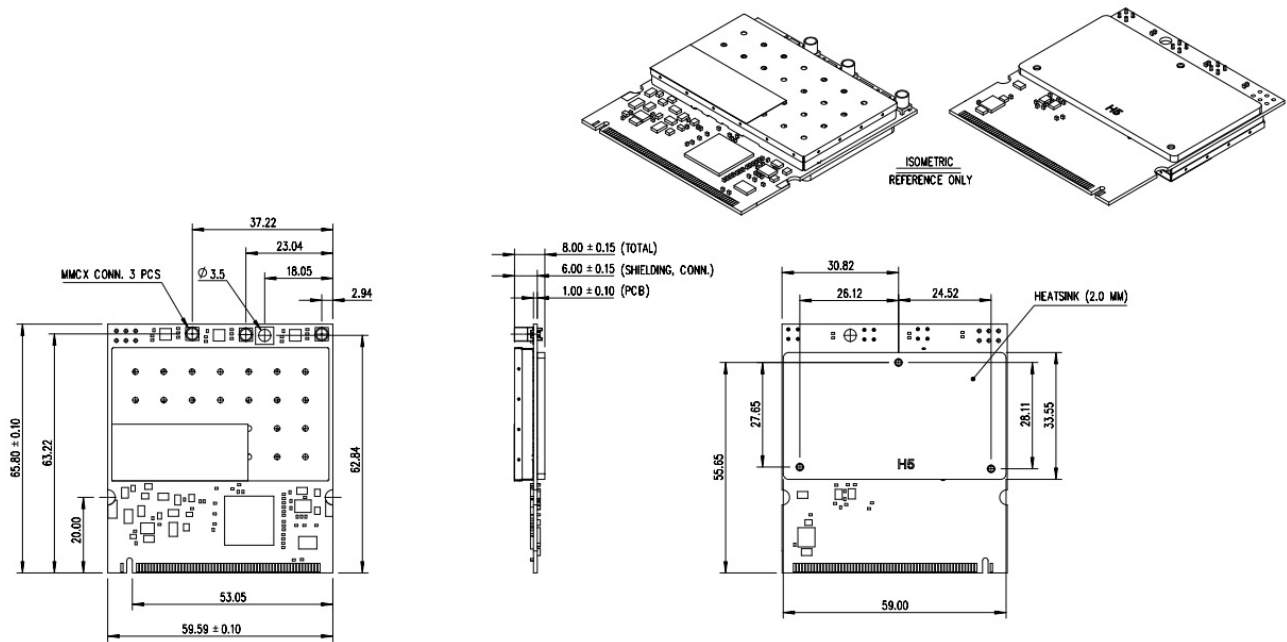


Hardware Block Diagram



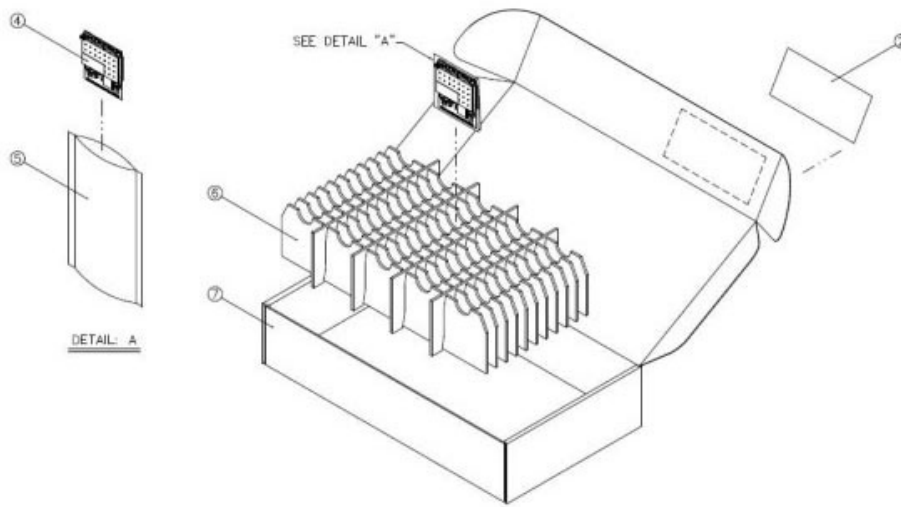
Mechanical Outline

Unit: mm

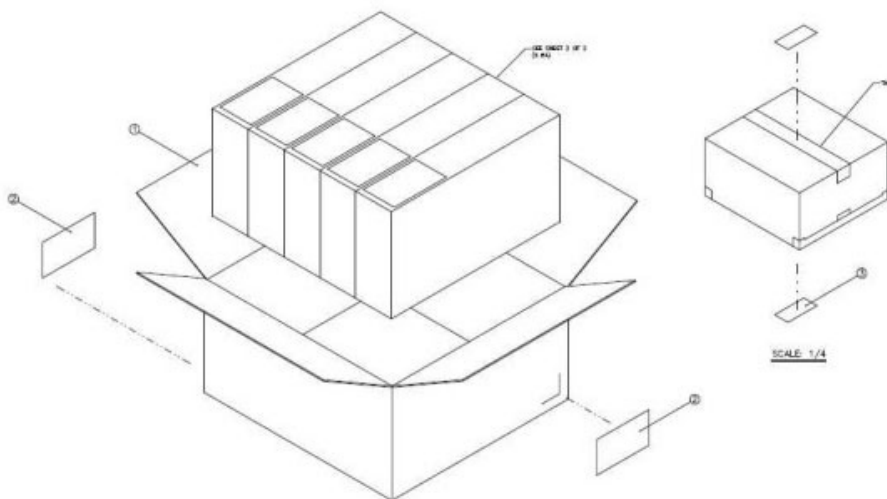


Packing Standard

Packing box: 50 pcs/box



Carton: 5 packing box/carton = 250 pcs/carton



Specifications:	
Chipset	Atheros AR9160-BC1B+AR9106
Standard Conformance	802.11a, 802.11b, 802.11g, and 802.11n
Frequency Range	<ul style="list-style-type: none"> ▪ USA: 2.400 ~ 2.483GHz, 5.15 ~ 5.35GHz, 5.5 ~ 5.7GHz, 5.725 ~ 5.825GHz ▪ 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
Interface	32-bit mini-PCI Type III A (15mm longer than III A type)
Operation Voltage	3.3V plus 5.0V ± 5% (5V is only for PA in high power application)
Modulation Technique	<ul style="list-style-type: none"> ▪ DSSS with CCK, DQPSK, DBPSK ▪ OFDM with BPSK, QPSK, 16QAM, 64QAM
Data Rate	<ul style="list-style-type: none"> ▪ 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: <ul style="list-style-type: none"> ◦ 20MHz channel: <ul style="list-style-type: none"> ◦ 1Nss: 65Mbps @ 800GI, 72.2Mbps @ 400GI (Max.) ◦ 2Nss: 130Mbps @ 800GI, 144.4Mbps @ 400GI (Max.) ◦ 40MHz channel: <ul style="list-style-type: none"> ◦ 1Nss: 135Mbps @ 800GI, 150Mbps @ 400GI (Max.) ◦ 2Nss: 270Mbps @ 800GI, 300Mbps @ 400GI (Max.)
Operating Channels	<ul style="list-style-type: none"> ▪ 802.11a/n <ul style="list-style-type: none"> ◦ USA/Canada: 23 non-overlapping channels ◦ Major Europe Countries: 19 non-overlapping channels ◦ Japan: 19 non-overlapping channels ◦ China: 5 non-overlapping channels ▪ 802.11b/g/n <ul style="list-style-type: none"> ◦ USA/Canada: 11 (1~11) ◦ Major Europe Countries: 13 (1~13) ◦ France: 4 (10~13) ◦ Japan: 14 for 802.11b (1~13 or 14th), 13 for 802.11g (1~13) ◦ China: 13 (1~13)

Specifications:

Output Power [total 3 chains composite power level]

- 802.11a:
 - +24.8dBm @ 6, 9, 12, 18, 24Mbps
 - +23.8dBm @ 36Mbps
 - +22.8dBm @ 48Mbps
 - +22.8dBm @ 54Mbps
- 802.11b:
 - +27.8dBm
- 802.11g:
 - +27.8dBm @ 6, 9, 12,18,24Mbps
 - +26.8dBm @ 36Mbps
 - +25.8dBm @ 48Mbps
 - +24.8dBm @ 54Mbps
- 802.11n 2.4GHz/HT20:
 - +27.8dBm @ MCS 0/8
 - +27.8dBm @ MCS 1/9
 - +27.8dBm @ MCS 2/10
 - +27.8dBm @ MCS 3/11
 - +26.8dBm @ MCS 4/12
 - +25.8dBm @ MCS 5/13
 - +24.8dBm @ MCS 6/14
 - +24.8dBm @ MCS 7/15
- 802.11n 2.4GHz/HT40:
 - +24.8dBm @ MCS 0/8
 - +24.8dBm @ MCS 1/9
 - +24.8dBm @ MCS 2/10
 - +24.8dBm @ MCS 3/11
 - +24.8dBm @ MCS 4/12
 - +24.8dBm @ MCS 5/13
 - +23.8dBm @ MCS 6/14
 - +23.8dBm @ MCS 7/15
- 802.11n 5GHz/HT20:
 - +25.8dBm @ MCS 0/8
 - +25.8dBm @ MCS 1/9
 - +24.8dBm @ MCS 2/10
 - +23.8dBm @ MCS 3/11
 - +22.8dBm @ MCS 4/12
 - +21.8dBm @ MCS 5/13
 - +20.8dBm @ MCS 6/14
 - +19.8dBm @ MCS 7/15
- 802.11n 5GHz/HT40:
 - +23.8dBm @ MCS 0/8
 - +23.8dBm @ MCS 1/9
 - +23.8dBm @ MCS 2/10
 - +22.8dBm @ MCS 3/11
 - +21.8dBm @ MCS 4/12
 - +20.8dBm @ MCS 5/13
 - +19.8dBm @ MCS 6/14
 - +18.8dBm @ MCS 7/15

Receiver Sensitivity

	Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum(3Rx dBm)
802.11a	6M	-82	-93/-89
	9M	-81	-93/-89
	12M	-79	-93/-89
	18M	-77	-92/-88
	24M	-74	-89/-85
	36M	-70	-86/-82
	48M	-66	-82/-78
	54M	-65	-80/-76
802.11b	1M	-82	-96/-92
	5.5M	-80	-93/-89
	11M	-76	-90/-86

Specifications:

	Data Rate	IEEE Spec(1 Rx dBm)	Typical/Maximum(3Rx dBm)	
802.11g	6M	-82	-95/-91	
	9M	-81	-95/-91	
	12M	-79	-95/-91	
	18M	-77	-94/-90	
	24M	-74	-91/-87	
	36M	-70	-88/-84	
	48M	-66	-84/-80	
	54M	-65	-82/-78	
802.11a/n HT20	MCS0	-82	-93/-89	
	MCS1	-79	-92/-88	
	MCS2	-77	-90/-86	
	MCS3	-74	-86/-82	
	MCS4	-70	-83/-79	
	MCS5	-66	-79/-75	
	MCS6	-65	-80/-76	
	MCS7	-64	-76/-72	
802.11a/n HT40	MCS0	-79	-90/-87	
	MCS1	-76	-89/-85	
	MCS2	-74	-87/-83	
	MCS3	-71	-84/-80	
	MCS4	-67	-81/-77	
	MCS5	-63	-77/-73	
	MCS6	-62	-76/-72	
	MCS7	-61	-73/-69	
802.11b/g/n HT20	MCS0	-82	-95/-91	
	MCS1	-79	-94/-90	
	MCS2	-77	-92/-88	
	MCS3	-74	-86/-82	
	MCS4	-70	-82/-78	
	MCS5	-66	-81/-77	
	MCS6	-65	-80/-76	
	MCS7	-64	-77/-73	
802.11b/g/n HT40	MCS0	-79	-89/-85	
	MCS1	-76	-89/-85	
	MCS2	-74	-89/-85	
	MCS3	-71	-86/-82	
	MCS4	-67	-83/-79	
	MCS5	-63	-79/-75	
	MCS6	-62	-77/-73	
	MCS7	-61	-74/-70	
Power Consumption [3T3R @ 25°C]		3.3V	5.0V	Standby
	11a (Avg/Max) mA	927/1006	554/596	397/431
	11b (Avg/Max) mA	340/388	977/1024	339/373
	11g (Avg/Max) mA	365/400	981/1033	339/373
	11n/2.4GHz (Avg/Max) mA	393/429	774/827	339/373
	11n/5GHz (Avg/Max) mA	928/1011	459/518	397/431

Specifications:	
Antenna	three DIP MMCX RF connector for robust antenna assembly Remark: please make sure to install three antennas on these three antenna ports before power on. For less than three antennas application, a 50 ohm terminator (or Unex's ACMCX-2) on each opened antenna port is required before power on. This is a high-power module, PA will be damaged and cause DC-short if leave antenna port open during transmission.
MAC Protocol	CSMA/CA with ACK architecture 32-bit MAC
Security	<ul style="list-style-type: none"> ▪ 64-bit, 128-bit and 152-bit WEP encryption ▪ 802.1x authentication ▪ AES-CCM & TKIP encryption
Operation Systems Supported	<ul style="list-style-type: none"> ▪ ath9k Linux, Windows ▪ Atheros Linux SDK for AP and client-mode sub-license available by project.
Frequency Tolerance	transmitted center frequency tolerance \pm 20ppm max.
Dimension	65.8mm (L) x 59.6mm (W) x 1.0mm (T)
Operation Temperature Range	-40°C ~ +75°C
Storage Temperature Range	-40°C ~ +80°C
Operating Humidity	10% ~ 95%, non-condensing
Storage Humidity	max. 95%, non-condensing
Environment-Friendly Compliance	RoHS

Ordering Information:	
DNMA-H5	Industrial-grade, high-power 802.11n a/b/g wifi 3x3 mini-PCI module w/ESD and Surge Protection, AR9160-BC1B+AR9106
ESD Cable	UL 1007 18AWG, length 19cm, for ground end to enclosure point tied to Earth Ground.
ACMCX-2	50 Ohm MMCX terminator

Important Notices on Application

1. Please make sure to install three antennas on these three antenna ports before power on. For less than three antennas application, a 50 ohm terminator (or Unex's ACMCX-2) on each opened antenna port is required before power on.
2. Please do not transmit power levels exceed max. target power in EEPROM's setting.
3. Please follow Unex's instruction document of single carrier test if test conducted.



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- Durable Bridge to Wireless

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