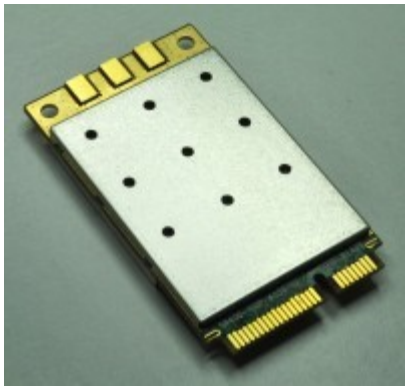
User Manual

NM-DB-3

Rugged/Military grade 2.4/5 GHz 3x3 MIMO Wi-Fi® Radio Transceivers



Features

- Qualcomm-Atheros AR9590-AR1B Chipset with Extended Temperature Range
- Up to 450 Mbps Throughput with 3x3 MIMO Technology
- Calibrated High Power 2.4 GHz (29 dBm) and 5 GHz operation (27 dBm) for Extended Range
- Supported Ath9k Linux Driver
- MiniPCIE Interface

TECHNICAL SPECIFICATIONS	
Model No.	NM-DB-3
MAC Chipset	Qualcomm Atheros QCA9590-AR1B with Extended Temperature range for Outdoor and Rugged models)
Software Support	Linux Drivers ath9k
Center Frequency Range	5.180 GHz -5.240 Ghz & 5.745 GHz -5.825 Ghz 2.412 GHz ~ 2.484 GHz This varies by the regulatory domain
Channel Bandwidth*	20, 40 MHz channels
Radio Modulation (Dynamic Link Adaptation)	BPSK, QPSK, 16 QAM, and 64 QAM (5.x GHz) CCK, BPSK, QPSK, 16 QAM, and 64 QAM (2.4 GHz)
Data Rates Supported	802.11a: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps (5.x GHz) 802.11n: MCS0-23 (5.x and 2.4 GHz) 802.11b/g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48 and 54 Mbps (2.4 GHz)
802.11n version 2.0 Capabilities	• 802.11n and b/g Beam Forming • Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Tx/Rx), Maximal ratio combining (MRC), Cyclic shift diversity (CSD), Frame aggregation, block ACK, 802.11e compatible bursting, Spatial multiplexing, cyclic-delay diversity (CDD), low-density parity check (LDPC), Space Time Block Code (STBC) • Phy data rates up to 450 Mbps (40 MHz channel)
Operating Modes	AP, STA and Adhoc modes to implement Point to Point, Point to multi Point
MAC Protocol	TDD with Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
Wireless Error Correction	FEC, ARQ
Wireless Data Security	128 bit AES, WEP, TKIP and WAPI hardware encryption. Support for IEEE 802.11d, e, h, i, k, r, v, w and time stamp standards
FIPS Certification	Loop back mode to facilitate FIPS AES certification, Small packet size (96 bytes) in AES encryption at full packet rate

Tx/Rx Specification	Radio Modulation	Coding Rate	Max Tx Power	Rx Sensitivity (Typ)
5 GHz (20 MHz Channel)				
802.11a, STBC	BPSK	1/2	26.79	-96
802.11a, STBC	64 QAM	3/4	26.79	-81
MIMO	BPSK	1/2	26.79	-93
MIMO	16 QAM	3/4	26.79	-83
MIMO	64 QAM	5/6	26.79	-72
5 GHz (40 MHz Channel)				
MIMO	BPSK	1/2	25.08	-90
MIMO	16 QAM	3/4	25.08	-79
MIMO	64 QAM	5/6	25.08	-69
2.4 GHz (20 MHz Channel)				
802.11b, STBC	1 Mbps	CCK	27.32	-100
802.11g, STBC	64 QAM	3/4	27.16	-80
802.11n, MIMO	BPSK	1/2	26.84	-92
802.11n, MIMO	16 QAM	3/4	26.84	-82

802.11n, MIMO	64 QAM	5/6	26.84	-72
2.4 GHz (40 MHz Channel)				
802.11n, MIMO	BPSK	1/2	26.94	-90
802.11n, MIMO	16 QAM	3/4	26.94	-79
802.11n, MIMO	64 QAM	5/6	26.94	-70

Note 1 It is advantageous to use the smallest Channel Bandwidth that can support the Throughput requirements. Smaller bandwidths provide more channels to choose and help avoid interference issues. The system's SNR is higher at smaller Channel Bandwidths and Range is longer.

Note 2 Max allowed Tx power depends on the regulatory domain

Antenna Signal Strength	-35 to -85 dBm (Recommended), Absolute Maximum=+12 dBm
Antenna port isolation for concurrent operation	Up to +10 dBm signal strength for 5 GHz signal without degrading 2.4 GHz operation Up to +5 dBm signal strength for 2.4 GHz signal without degrading 5.x GHz operation
Integrated Antenna Port Protection	>20 KV (Human Body Model)
Receiver LNA Gain	>10 dB
Receiver Adjacent Channel Rejection (ACR)	>18 dB @ 11a, 6 Mbps (Typ)
Receiver Alternate Channel Rejection (ALCR)	>35 dB @ 11a, 6 Mbps (Typ)
Receive chain Noise Figure	+6 dB
Transmitter Adjacent Channel Leakage power Ratio (ACLR)	45 dB (Fc ± ChBW)
Transmitter Spurious Emission Suppression	-40 dBc
RF Power control	In 0.5 dBm steps. Accuracy of power calibration loop ±2 dBm. Each transceiver individually calibrated and tested.
RF Hardware Disable (RF Kill)	Pin 20 of miniPCI-E interface. (Required for FAA compliance)
Control for External Power Amp	Available as an optional configuration
Spectral Analysis	8 bit resolution spectral FFTs available for software analysis
PHYSICAL, ENVIRONMENTAL AND OTHER SPECIFICATIONS	
Antenna Ports	3 Ports (50 Ohms) with MMCX connectors.
Host Interface	miniPCI-Express 1.2 Standard
Host CPU Board	Any CPU board with Industry standard miniPCI-Express interface with minimum 6 mm connector height
Operating Voltage	3.3 Volts from miniPCI-Express connector
Power Consumption	5.3W @ Max power, in continuous data transfer mode on all chains 3.75W @ 25 dBm power, in continuous data transfer mode on all chains 2.5W @ 20 dBm power (ETSI max), in continuous data transfer mode on all chains 0.9W in continuous data receive mode 250 mW in Sleep mode
Shield case temperature range (Operating)	-40°C to +80°C The System's thermal design should ensure that the transceiver's case temperature is maintained within these specifications.
Humidity (Operating)	0% – 95% (Non-condensing)
Dimensions	30 x 50 x 7 mm, 14 grams

	Mechanical drawing and 3D-CAD files available upon request
Regulatory Requirements	Designed and Verified to meet various regulatory requirements. Formal testing and approval is required based on the Integrator’s particular host platform and antenna type. The Integrator is also responsible for obtaining all required regulatory approvals in target markets for the finished product.
FCC ID	2AG87NM-DB-3N
CE/ETSI	Q3 2016
Industry Canada (IC)	Q3 2016
RoHS/WEEE Compliance	Yes. 100% Recyclable/Biodegradable packaging

FCC Statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

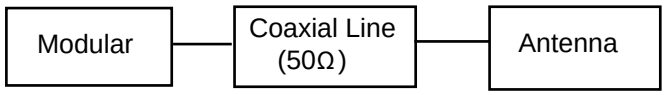
-- Reorient or relocate the receiving antenna.
-- Increase the separation between the equipment and receiver.
-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-- Consult the dealer or an experienced radio/TV technician for help

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1)this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

Radiation Exposure Statement:

The modular can be installed or integrated in mobile or fix devices only.
This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.
The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.
The firmware setting is not accessible by the end user.
The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module.
This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID:2AG87NM-DB-3N Or Contains FCC ID:2AG87NM-DB-3N” when the module is installed inside another device, the user manual of this device must contain below warning statements;
1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.
The antenna type used is the reverse screw R-SMA antenna and the max antenna gain is 3dBi.
The diagram shows how to connect the modular with its intended antenna .



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