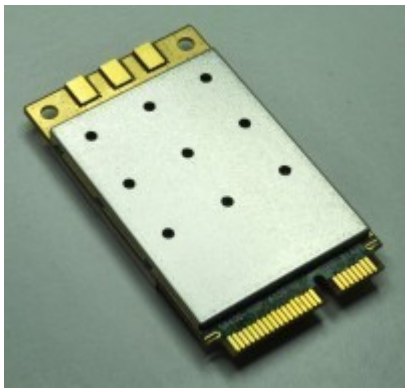
NM-DB-2

Rugged/Military grade 2.4GHz 2x2 MIMO Wi-Fi® Radio Transceivers



Features

- Qualcomm-Atheros AR9590-AR1B Chipset with Extended Temperature Range
- Up to 300 Mbps Throughput with 2x2 MIMO Technology
- Calibrated High Power 2.4 GHz (27 dBm)
- Supported Ath9k Linux Driver
- MiniPCIE Interface

TECHNICAL SPECIFICATIONS	
Model No.	NM-DB-2
MAC Chipset	Qualcomm Atheros QCA9590-AR1B with Extended Temperature range for Outdoor and Rugged models)
Software Support	Linux Drivers ath9k
Center Frequency Range	2.412 GHz ~ 2.462 GHz This varies by the regulatory domain
Channel Bandwidth*	20, 40 MHz channels
Radio Modulation (Dynamic Link Adaptation)	CCK, BPSK, QPSK, 16 QAM, and 64 QAM (2.4 GHz – 11n models)
Data Rates Supported	802.11n: MCS0-15 (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	• 802.11 dynamic frequency selection as an AP and Client • 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,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 802.11b, g, n 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	Tx Power (±2dBm)[2]	Rx Sensitivity (Typ)
2.4 GHz (20 MHz Channel)				
802.11b, STBC	1 Mbps	CCK	27	-100
802.11g, STBC	64 QAM	3/4	22	-80
802.11n, MIMO	BPSK	1/2	27	-92
802.11n, MIMO	16 QAM	3/4	25	-82
802.11n, MIMO	64 QAM	5/6	22	-72
2.4 GHz (40 MHz Channel)				
802.11n, MIMO	BPSK	1/2	27	-90
802.11n, MIMO	16 QAM	3/4	25	-79
802.11n, MIMO	64 QAM	5/6	22	-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 +5 dBm signal strength for 2.4 GHz signal
Integrated Antenna Port Protection	>20 KV (Human Body Model)
Receiver LNA Gain	>10 dB
Receiver Adjacent Channel Rejection (ACR)	>18 dB @ 11g, 6 Mbps (Typ)
Receiver Alternate Channel Rejection (ALCR)	>35 dB @ 11g, 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	2 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	4W @ Max power, in continuous data transfer mode on all chains 2.8W @ 25 dBm power, in continuous data transfer mode on all chains 2W @ 20 dBm power (ETSI max), in continuous data transfer mode on all chains 0.7W in continuous data receive mode 230 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	2ATBY-NMDB-2
CE/ETSI	Q3 2016
Industry Canada (IC)	Q3 2016
RoHS/WEEE Compliance	Yes. 100% Recyclable/Biodegradable packaging

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: 2ATBY-NMDB-2”.

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Singapore:
Doodle Labs (SG) Pte. Ltd.
150 Kampong Ampat
KA Center, Suite 05-03
Singapore 368324
Tel: +65 6253 0100

USA:
Doodle Labs LLC
2 Mattawang Drive
Somerset, NJ 08873
Tel: +1 862 345 6781
Fax: +65 6353 5564