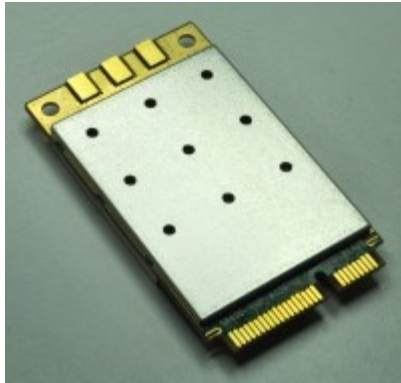


NM-2450-2F

Rugged/Military grade 2.4 GHz 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) and 5 GHz operation (25 dBm) for Extended Range
- 802.11 Dynamic Frequency Selection (DFS) in AP and Client mode
- Supported Ath9k Linux Driver
- MiniPCIE Interface

TECHNICAL SPECIFICATIONS				
Model No.	NM-2450-2F (802.11n, ath9k driver)			
MAC Chipset	11n Models – Qualcomm Atheros QCA9590-AR1B with Extended Temperature range for Outdoor and Rugged models)			
Software Support	Linux Driver ath9k			
Center Frequency Range	2.412 GHz ~ 2.484 GHz This varies by the regulatory domain			
Channel Bandwidth*	20, and 40 MHz channels			
Radio Modulation (Auto Adjust)	CCK, BPSK, QPSK, 16 QAM, and 64 QAM (2.4 GHz – 11n models)			
Data Rates Supported	802.11n : MCS0-23 802.11b/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)			
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 (± 2 dB)	Rx Sensitivity (Typ)
20 MHz Channel – 11n models				
802.11b, STBC	CCK	1/2	28	-100
802.11b, STBC	64 QAM	3/4	26	-80
MIMO	BPSK	1/2	28	-92
MIMO	16 QAM	3/4	28	-82
MIMO	64 QAM	5/6	26	-72
40 MHz Channel – 11n models				
MIMO	BPSK	1/2	28	-90
MIMO	16 QAM	3/4	28	-79
MIMO	64 QAM	5/6	26	-70
* 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.				
Antenna Signal Strength	-35 dBm to -85 dBm (Recommended), (Absolute Maximum=+12 dBm)			
Antenna port isolation for concurrent operation	+10 dBm signal strength for 5 GHz signal without degrading 2.4 GHz operation			
Integrated Antenna	>20 KV (Human Body Model)			

Port Protection	
Receiver LNA Gain	+10 dB
Receiver Adjacent Channel Rejection (ACR)	>38 dB @ 11g, 6 Mbps (Typ)
Receiver Alternate Channel Rejection (ALCR)	>42 dB @ 11g, 6 Mbps (Typ)
Receive chain Noise Figure	+6 dB
Transmitter Adjacent Channel Leakage power Ratio (ACLR)	45 dB ($F_c \pm \text{ChBW}$)
Transmitter Spurious Emission Suppression	-40 dBc
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
RF Power control	In 0.5 dBm steps. Accuracy of power calibration loop ± 2 dBm. Each transceiver individually calibrated and tested.
PHYSICAL, ENVIRONMENTAL AND OTHER SPECIFICATIONS	
Antenna Ports	2 MMCX Ports (50 Ohms)
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-E interface for radio 3~4.5V for FES. Optional DC-DC converter available for 6V~38V power input.
Power Consumption	Total 16W (14W @ Max power for FES, in data transfer mode on all chains + 2W for radio module) Total 10W (8W @ 20 dBm power for FES in continuous data transfer mode on all chains + 2W for radio module) 1.2W total power in continuous data receive mode
Shield case temperature range (Operating)	-40°C to +80°C The System's thermal design should ensure that the transceiver's shield case temperature is maintained within these specifications. Prism-FES can be mounted away from the host CPU board for better thermal design
Cable Assembly	Includes the harness with RF cable and DC power for Prism-FES
Humidity (Operating)	0% – 95% (Non-condensing)
Dimensions	1x 30 x 50 x 6 mm Radio module, 2x 30 x 52 x 7 mm FES modules, 14 + 2x23 = 60 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. The Integrator is also responsible for obtaining any other

	required regulatory approvals in target markets for the finished product. Doodle Labs can offer assistance for compliance testing of the System Integrator's host platform.
FCC ID	Q3 2016
CE Certification	Q3 2016
IC Certification	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

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.

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 co-located 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 final end product must be labelled in a visible area with the following:

"Contains Transmitter Module 2AG87NM-2450-2F"

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not 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

The module could be only used as a system and integrated as a system and compliance with the Section 15.204(b) rule part.

IC Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The term "IC: " before the certification/registration number only signifies that the Industry Canada technical specifications were met. This product meets the applicable Industry Canada technical specifications.

Le présent appareil est conforme aux CNR d'Industrie Canada applicable aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

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