

## Smart Radio RM-2450-2H

2.4-GHz, Rugged, Long Range 2 Stream Broadband Radio Transceiver



### Features

- Very low size, weight, and power (SWaP) for mobile applications
  - 57x68x11 mm, 70 grams (2 stream)
- Available in frequency bands up to 6 GHz
- Configurable channel size from 3~40 MHz
- Dynamic Link adaptation to optimize throughput depending on channel conditions
- Adaptive radio modulations from DSSS up to 64QAM
- High Tx power for long range (adjustable up to 1W)
- Up to 50 Mbps lperf throughput
- Ethernet interface to allow easy integration into various applications
- Point-to-Point, Point-to-Multipoint, and Adhoc operating modes
- Mobile mesh router (Optional)
- High wireless data security with up to 256-bit AES encryption
- OTA firmware upgrade
- Industrial temperature range (-40C to +85C)
- COTS – Commercial off the Shelf

### Target Applications

- Unmanned Aerial Vehicles (Drones)
- Mobile robotics
- Mines and Construction site machines
- Public Safety/Video surveillance
- Private Networks in Oil and gas fields
- Wind Turbine and Solar farms
- Wireless ethernet extensions

TECHNICAL SPECIFICATIONS				
Model No.		RM-2450-2H (Rugged, Long Range applications)		
Chipset		Qualcomm Atheros QCA4531 with Extended Temperature range		
Software Support		<u>OpenWRT</u> (Wireless Router/Linux OS)		
Center Frequency Range		2412 MHz ~ 2462 MHz		
Channel Bandwidth*		20/40 MHz		
Radio Modulation (Auto Adjust)		CCK, BPSK, QPSK, 16 QAM, and 64 QAM		
Data Rates Supported		<u>802.11 b/g</u> : 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48 and 54 Mbps (2.4 GHz) <u>802.11n</u> : MCS0-15		
802.11n version 2.0 Capabilities		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, and Mesh networks		
MAC Protocol		TDD with Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)		
Wireless Error Correction		FEC, ARQ		
Wireless Data Security		256 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	Tx Power (±2dBm)**	Rx Sensitivity (Typ)
<b>20 MHz Channel</b>				
802.11n	BPSK	1/2	30	-93

802.11n	16 QAM	3/4	30	-80
802.11n	64 QAM	3/4	27	-72

\* 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 to -85 dBm (Recommended), Absolute Maximum=+12 dBm
Receiver LNA Gain	>10 dB
Receive chain Noise Figure	6 dB
RF Power control by Driver	In 0.5 dBm steps. Accuracy of power calibration loop $\pm 2$ dBm. Each transceiver individually calibrated and tested.
Control for External Power Amp	Available as an optional configuration
Receiver Adjacent Channel Rejection (ACR)	>18 dB @ 11a, 6 Mbps (Typ)
Receiver Alternate Channel Rejection (ALCR)	>35 dB @ 11a, 6 Mbps (Typ)
Transmitter Adjacent Channel Leakage power Ratio (ACLR)	45 dB ( $F_c \pm \text{ChBW}$ )
Transmitter Spurious Emission Suppression	-40 dBc

#### PHYSICAL, ENVIRONMENTAL AND OTHER SPECIFICATIONS

Antenna Ports	2 Ports (50 Ohms) with MMCX connectors
Integrated Antenna Port Protection	>20 KV (Human Body Model)
Host Interface	100Base-T Ethernet
Host CPU Board	Any CPU board with Industry standard miniPCI-Express interface with minimum 6 mm connector height
Operating Voltage	5~42 V

Power Consumption	9.0W in data transfer mode 3.3W in data receive mode
Shield case temperature range (Operating)	-40°C to +85°C (Rugged, Long range RM-915-1G model) The System's thermal design should ensure that the transceiver's shield case temperature is maintained within these specifications.
Cable Assembly	Assembly drawing available upon request.
Dimensions	68 x 57 x 11.5 mm 70 grams Mechanical drawing and 3D-CAD files available upon request
Humidity (Operating)	0% – 95% (Non-condensing)
Regulatory Requirements	Designed and Verified to meet various regulatory requirements. Formal testing and approval is required based on the System Integrator's particular host platform and antenna type. The System Integrator is also responsible for obtaining all 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.
RoHS/WEEE Compliance	Yes. 100% Recyclable/Biodegradable packaging

\* Specifications are subject to change without prior notice.

## **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 a Permissive Class II Change or new Certification is required.

## **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: 2AG87RM-2450-2H".

## **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.

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## 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.

1, This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be collocated or operating in conjunction with antenna or transmitter. If the IC 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 label referring to the enclosed module. This exterior label can use wording such as the following: Contains Transmitter Module IC number: 21411-RM24502H Or Contains IC number: 21411-RM24502H when the module is installed inside another device.

2, 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. This device is intended only

for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and user.
- 2) The transmitter module may not be co-located with any other transmitter or antenna. Module Antenna Type: External Antenna, ANT Gain: 2dBi

3, This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body.

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

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED définies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de distance de 20cm entre le radiateur et n'importe quelle partie de votre corps.

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