Doodle Labs Mini OEM Mesh Rider Radio - 915MHz and 2.4GHz

Overview

The Mini OEM Mesh Rider Radio is an advanced Manet router. The Mini OEM Mesh Rider Radio employs Doodle Labs' patented Mesh Rider® technology with state-of-the-art RF and networking capabilities that enable communication further, faster, and more reliably than any comparable solution on the market. For example, optimized video streaming carries crystal clear 4K video while simultaneously carrying low latency Command and Control data.

The interoperable Mesh Rider Radio platform is available in many frequency bands between 600 MHz and 6 GHz in Mini, Nano, OEM, Wearable form factors. This flexibility allows customers to use their industry speciíc frequency bands for deploying private wireless networks that encompasses all the use cases for human and machine collaboration.
For more information, please visit: https://doodlelabs.com/mesh-rider-radios/

Preliminary Datasheet

Key Features - Mesh Rider Radio Platform

PERFORMANCE RF

- Long range (field tested >100km) and high throughput (up to 100 Mbps) Mesh Rider waveform
- Interference resistant COFDM for robust link quality in difficult RF environments
- Exceptional Multipath and NrLOS MIMO performance
- Adaptive radio modulations from BPSK up to 64QAM, with fast per packet optimization to maximize link performance in dynamic environments
- Software defined channel bandwidth for efficient re-use of spectrum
- Convolutional coding, Forward Error Correction (FEC), ACK-retransmits, Maximal Ratio Combining, Spatial Multiplexing, and Space Time Block Coding for robust data transmission over noisy channel/spectrum
- Single channel, Time Division Duplexing (TDD) for bi-directional traffic Resistant to high-power jamming signals
- ATPC for widely dispersed mesh network
- Built-in Spectrum Scanner to help mitigate interference issues

PERFORMANCE NETWORKING

- Ultra-Reliable Low Latency Channel (URLLC) for Command and Control
- Optimized video streaming channel for Unicast and Multicast transport
- Self-healing/self-forming multifrequency mobile mesh for highly reliable network with redundancy
- FIPS Certified AES 256- and 128-bit encryption
- End-to-end IP architecture with Ad Hoc, WDS transparent bridge, Client, AP, and Internet Gateway operating modes
- Embedded network management APIs

ADDITIONAL FEATURES

- Very small size, weight, and power for mobile applications
- Ethernet, USB, and UART interfaces to allow easy integration into different system architectures
- Leverage the benefits of the most extensible OpenWrt ecosystem and install 3rd party IoT applications
- Rugged, vibration resistant construction to meet MIL-specs
- MIL-spec temp range (-40C to +85C)
- High quality, manufactured in ISO 9001 and ISO 14001 certified facilities
- COTS – Commercial oì the Shelf
- Extended lifespan and availability

Preliminary Datasheet

System Integration

- The Mesh Rider Radio has been designed to be plug and play. Only USB and a power supply are required for integration. Visit Doodle Labs Technical Library for extensive design-in documents.
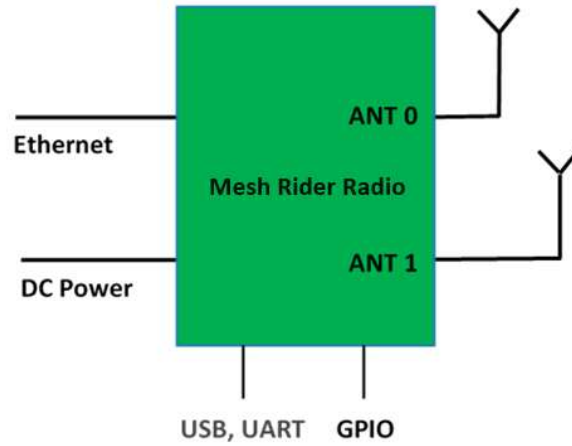
Technical Specifications (915MHz and 2450MHz Bands)

Model Category	Xtreme
ORDERING CODES	
Radio Configuration	2x2 MIMO
Model #	RM-1700-22M3
Antenna (Optional)	ANT-1700-3-O
Evaluation Kit	EK-1700: 2x Multi-band Antenna, Breakout board, Cables
Design-In Documentation	Doodle Labs Technical Library
PERFORMANCE OVERVIEW	
Max Operating Range (Indicative)	>20 Km (Recommended), (Max field demonstrated range >100km)
Max Data Throughput at 10-meter range with specified Antennas (Indicative)	80 Mbps (20 MHz Channel) 40 Mbps (10 MHz Channel) 20Mbps (5MHz Channel)
Over the Air Data Encryption	128-bit AES (Full throughput) 256-bit AES (12 Mbps max throughput) (FIPS140-3)(optional)
Operating Modes	Mesh, WDS AP, WDS Client Bridged or Internet Gateway with NAT
Command & Control channel	Ultra-Reliable Low Latency Channel (URLLC). Latency 1.5 - 15 ms
Video Channel	Optimized video streaming with Unicast and Multicast transmission

Model Category	Xtreme
RF SPECIFICATIONS	
Protocol Compatibility	Fully compatible with Doodle Labs Mesh Rider Waveform
Frequency Range	915-MHz and 2450-MHz Bands
Operating Bands (Software Selectable)	902-928 MHz 2400-2482 MHz
Advanced Band Filters	Dedicated SAW filters for high interference immunity
Channel Sizes (Software Selectable)	915MHz Band: 5MHz/ 10MHz 2.4GHz Band: 10MHz/ 20MHz
Radio Data Rate	Auto adapting Modulation Coding Scheme (MCS0-15)
RF Power Output (Typ) **Each radio individually calibrated**	1W (30 dBm)
Antenna Signal Strength	-30 to -90 dBm (Recommended), Absolute Maximum= +12 dBm
Receiver LNA Gain	>10 dB
RF Power Control	In 1dB steps, Tolerance +/-1dB
Integrated Antenna Port Protection	Able to withstand open port, >10 KV (contact) and >15KV (open air discharge) as per IEC-61000-4-2
Wireless Error Correction	FEC, ARQ
Transmitter Spurious Emission Suppression	< - 40 dBc
Frequency Accuracy	±10 ppm max over life
Automatic Transmit Power Control (ATPC)	Intelligently adjusts the transmit power for very close range operation
NETWORKING SPECIFICATIONS	
Mesh Router	Self-Forming/Self-Healing, Peer to Peer
Custom Software Package Manager	Image Builder, OPKG, ipk
Radio Management	Web GUI (HTTPs), SSH and JSON-RPC
Access control	Password, MAC, IP, Port filtering
Supported Protocols	IPv6, QoS, DNS, HTTPS, IP, ICMP, NTP, DHCP
Software Upgrade	Over the air software upgrade supported

Model Category	Xtreme
HARDWARE SPECIFICATIONS	
Operating Voltage	5V +/- 5% DC
DC Power Consumption	915-MHz: Average 7W (50% Tx/Rx duty cycle), 10W Peak Tx power @ max range, 4.5W Rx mode 2450-MHz: Average 5W (50% Tx/Rx duty cycle), 8W Peak Tx power @ max range, 2W Rx mode
Dimensions	Baseband: 47 x 28 x 5 mm RF Board: 46 x 51 x 6.5 mm 36.5 grams
Interfaces	2x RJ45, UART, USB, 2x GPIO
Antenna Connection	2x MMCX-Female connector
Host Interface	Ethernet (100 Base-T), USB -Dev, 1x UART (3.3V)
Temperature range (Operating)	Industrial: -40°C to +85°C
	System's thermal design should ensure that the radio's case temperature is maintained within these specifications.
Ingress Protection (Embedded)	IP 50, Dust Protected, No Liquid protection
Shock and Vibration Resistance	Compliant to MIL-STD-810H for high shock and vibration
Reliability	Extreme Reliability, IPC Class 2 standard with Class 3 options
Integrated CPU	MIPS 24K, 540 MHz, 32MB Flash, 64MB DDR2 RAM
MTBF	>235k hours (25 years)
Humidity (Operating)	5% – 95% (Non-condensing)
Life Cycle Planning	Extended lifespan with 7 years guaranteed availability
REGULATORY INFORMATION	
FCC ID	2AG87RM1700-2M (in progress)
Industry Canada (IC)	21411-RM17002M (in progress)
Regulatory Requirements	Designed and verified to meet various regulatory requirements. Formal testing and approval are required for the Integrator's antenna type. The Integrator is responsible for obtaining all regulatory approvals in target markets for the finished product.
RoHS/WEEE Compliance	Yes. 100% Recyclable/Biodegradable packaging

* Specifications are subject to change without prior notice

FCC Regulatory Statement:

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.

Warning: 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 interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or televisión 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

RF Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna used with this transmitter must be installed to provide a minimum separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi- transmitter product procedures.

This device is intended only for OEM integrators under the following conditions:
1. The antenna must be installed such that 20cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,

Important Note:
In the event that these conditions cannot 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 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.

Labeling and Notice to OEM Integrator
If the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must display a label referring to the enclosed module. This exterior label can use wording as follows:

Contains Transmitter Module FCC ID: 2AG87RM1700-2M
or
Contains FCC ID: 2AG87RM1700-2M

A transmitter with a modular grant can be installed in different end-use products (referred to as a host, host product, or host device) by the grantee or other equipment manufacturer, then the host product may not require additional testing or equipment authorization for the transmitter function provided by that specific module or limited module device.

A host product itself is required to comply with all other applicable FCC equipment authorization regulations, requirements, and equipment functions that are not associated with the transmitter module portion. For example, compliance must be demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators (Part 15 Subpart B), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification or Declaration of Conformity) as appropriate (e.g.,Bluetooth and Wi-Fi transmitter modules may also contain digital logic functions).

Reference to KDB Publication 996369 D04 Module Integration Guide (which is available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) https://apps.fcc.gov/oetcf/kdb/index.cfm), any manufacturer of the host device which installs this modular with unlimited modular approval should perform the test of radiated and conducted emission and spurious emission, etc. according to FCC CFR Title 47 Part 15.247 requirement, only if the tests result comply with FCC CFR Title 47 Part 15.247 requirement, then the host can be sold legally.

A user's manual for the finished product should include the following statement:
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 interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or televisión 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

IC Regulatory Statement:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
1.   This device may not cause interference.
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 ISED Canada technical specifications were met. This product meets the applicable ISED Canada technical specifications.

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

RF exposure statement:
This device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

The equipment complies with IC Radiation exposure limit set forth for uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Important Note:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the ISED 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 Canada authorization.

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l' ISED ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

Labeling and Notice to OEM Integrator
If the IC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must display a label referring to the enclosed module. This exterior label can use wording as follows:

Contains Transmitter Module IC: 21411-RM17002M
or
Contains IC: 21411-RM17002M

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Déclaration d'exposition RF:
cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 2.5 du cnr - 102 et conformité avec rss 102 de l'exposition aux rf, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs rf et la conformité.

L'équipement est conforme à la limite d'exposition aux radiations de la IC établie pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.

Manual Information to the End User
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.

Manuel d'information à l'utilisateur final
L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.