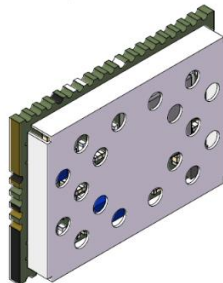




DATASHEET

RMLORAB

RMLORAB is a Long Range (LoRa) transceiver module for the sub-1GHz ISM bands such as 868MHz (Europe) and 915MHz (North America), optimized for ultra-low-power applications. This module combines the ATSAMR35J18 Sip (System-in-Package), 32.768KHz crystal, 32MHz TCXO, RF switch, lumped element harmonics rejection filter, impedance matching circuits and required RF shielding in a compact 18.8 mm x 13.5 mm M5 form factor design. The LoRa technology is a spread spectrum protocol optimized for low data-rate, ultra-long range signaling. It is ideal for battery-powered applications in industry IOT domain.



Key Features

- Ultra compact size: M5 form factor 18.8 x 13.5 mm; M3 form factor: 46*26 mm;
- Ultra low power consumption
- long wireless communication range
- 256K Flash and 40K SRAM
- RoHS compliant

Applications

- Industrial Internet
- Smart cities
- Energy engagement/ Smart grids

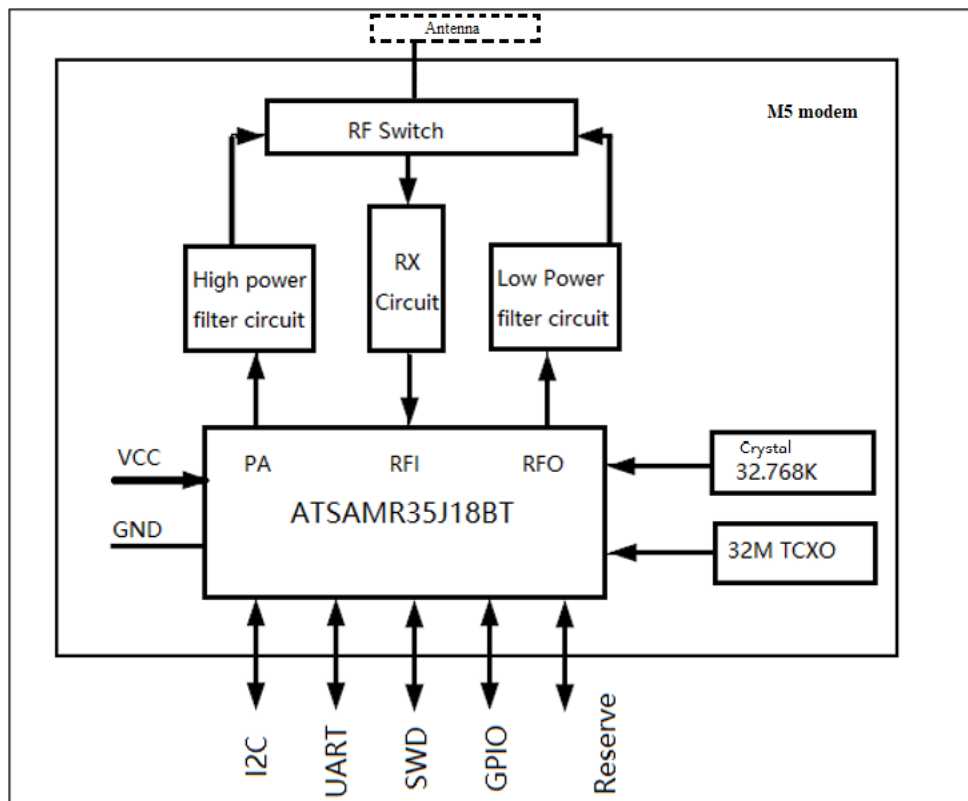


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1. Block Diagram:

RMLORAB combines the ATSAMR35J18 Sip (System-in-Package), 32.768KHz crystal, 32MHz TCXO, RF switch, lumped element harmonics rejection filter, impedance matching circuits in a compact 18.8mm x 13.5mm form factor. It supports Euro band 868MHz, North America Band 902~928MHz, India Band 865~867MHz, Russia band 869MHz. User only need to design an antenna to achieve a long-distance connection.



RMLORAB Block

2. Specifications

2.1 Important Notice

The electrical specification of the module is directly related to the Microchip ATSAMR35J18 Sip, below information is only a summary of the main parameters. For more detailed information, please refer to the up-to-date specifications of chipsets available on Microchip website.



2.2 Absolute Maximum Ratings

Parameters	Min	Type	Max	Unit
Supply Voltage VCC	2.4	3.3	3.6	V
IO & Control Pins	0	3.3		V
Storage Temperature	-40	23	85	°C

2.3 Current Consumption

Parameters	Min	Type	Max	Unit	Condition
Transmit ①		125		mA	BW=500k SF=9, C/R=4/5, Pout=17.5dBm PA Enabled
Transmit ②		40		mA	BW=500k SF=9, C/R=4/5, Pout=12.5dBm F=915MHz RFO
Transmit ③		115		mA	BW=500k SF=9, C/R=4/5, Pout=17.5dBm F=868MHz PA_Boost
Transmit ④		38.5		mA	BW=500k SF=9, C/R=4/5, Pout=12.5dBm F=868MHz, RFO PA Disabled
Receive current		15		mA	
idle		2		mA	default

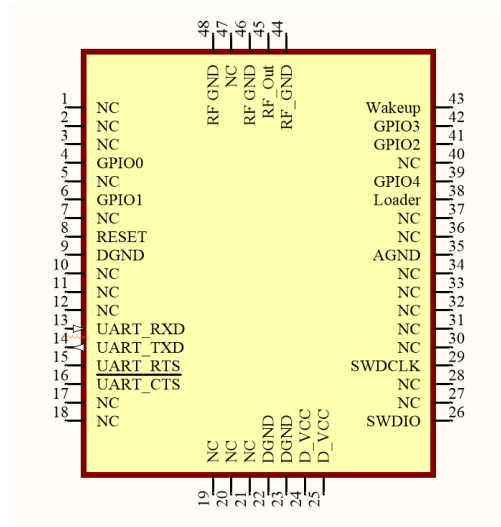
Sleep			10	uA	Average sleep current
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2.4 Radio Specifications

Parameters	Min	Type	Max	Unit	Remark
Frequency Band 1		868.3		MHz	Euro
Frequency Band 2	902	915	928	MHz	North America
Frequency Band 3	865.6		866.4	MHz	India
Frequency Band 4		869		MHz	Russia
RF Power range	2		18	dBm	PA Enable @915MHz
RF Power range	-2.5		13.5	dBm	PA Disable @915MHz
Power fluctuation		±1		dBm	-40 °C ~+60 °C
Harmonic restraining		50		dBc	
Port Impedance		50		ohm	
Sensitivity level for PER<1%		-119		dBm	Bandwidth:500 KHz SF=9 payload=10 bytes
Distance range		1.7		km	External antenna
Data rate		4		kbps	
Duty Circle			1.5%		
Modulation		LoRa			
Connector	Half-cut metal hole or UFL or MMCX connector				
Antenna Gain			3	dBi	O-mini or FPC antenna



3. Pin Definitions

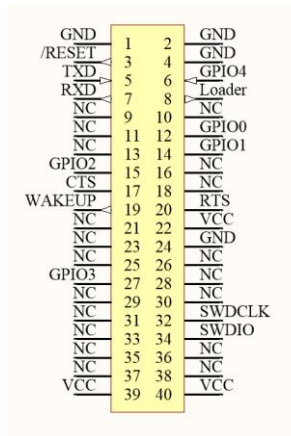


RMLORAB M5 Form factor Pinout Diagram

Pin	Pin Name	Description	Remark
1/2/3/5/7/10/11/12/17/18/ 19/20/21/27/28/30/31/32/ 33/34/36/37/40	NC	Not Connected	
4/6/39/42	GPIO		
41	GPIO	Status indicator	Reserved
9/22/23/35/44/46/48	GND	Ground	
8	Reset	Reset	
13	UART_RXD	Input from Host	
14	UART_TXD	Output to host	
15	UART_RTS	Reserved	
16	UART_CTS	Reserved	
24/25	VCC	2.4V~3.6V	
26	SWDIO	Programming/Debug	Reserve a plug and play connector
29	SWDCLK	Programming/Debug	Reserve a plug and play connector
38	Loader	Internal Pull-down for Application, Pull-up for programming	Connect to MCU GPIO

43	Wakeup	Wakeup Pin, a pull-down edge to wakeup it.	Connect to MCU GPIO
45	RF_OUT	50ohm RF Port	

RMLORAB M5 Form factor Pinout Assignment



RMLORAB-M3 Pinout Diagram

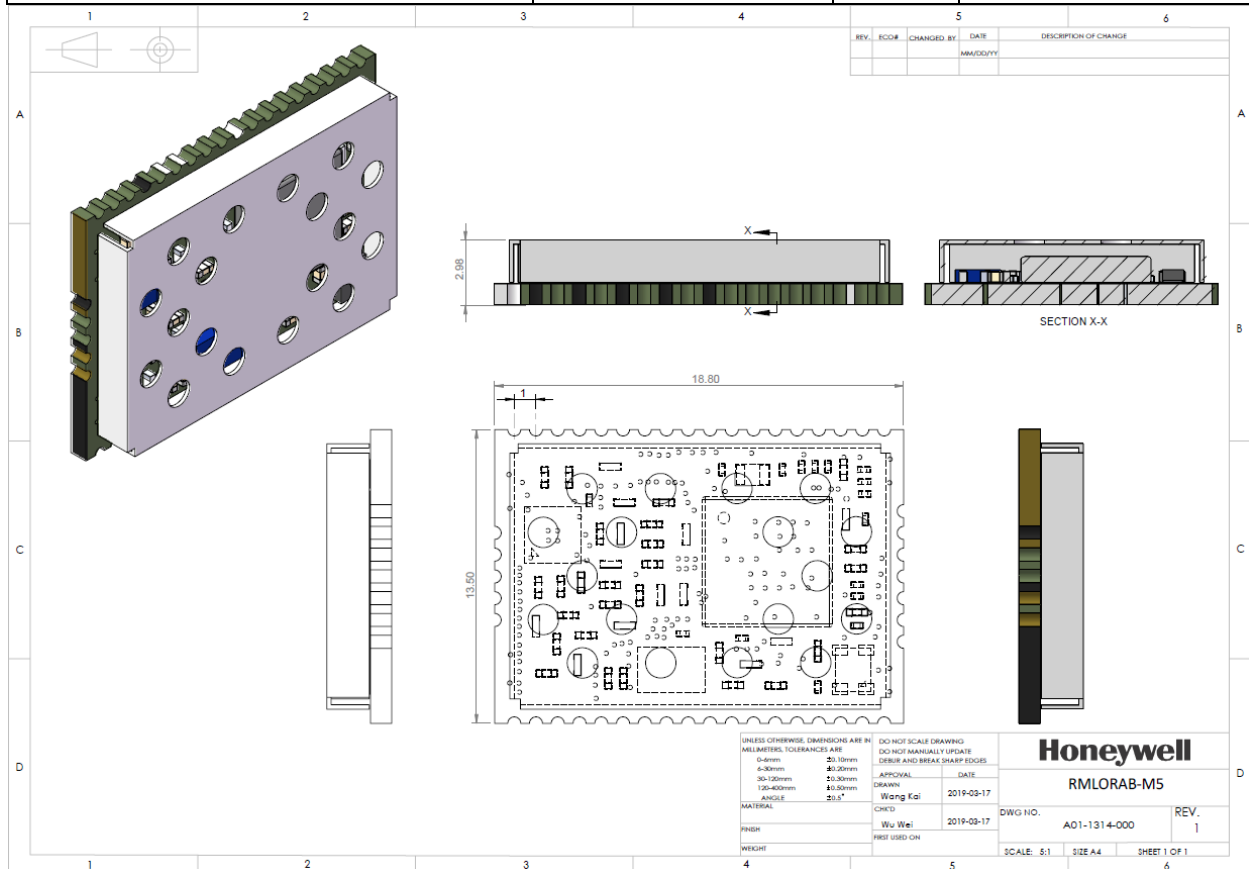
Pin	Pin Name	Description	I/O
1/2/4/24	GND	Ground	
3	Reset	Active-low	I/O
5	TXD	Modem TXD, Output to host	O
6	GPIO4		
7	RXD	Modem TXD, input from host	I
8	Loader	Recommend to pull-up	I
9,10,11,13,16,18,21,23,25,26,28,29,30,31,33,35,36,37,38	PB12	NC	I
12	GPIO0	Reserved GPIO	I
14	GPIO1	Reserved GPIO	I/O
15	GPIO2	Status indicator	
17	CTS	Reserved	
19	Wake-up	Active low	
20	RTS	Reserved	
27	GPIO3	Reserved GPIO	
32	SWDCLK	Debug & Programming	I

34	SWDIO	Debug & Programming	I
22/39/40	VCC	Digital voltage supply	I

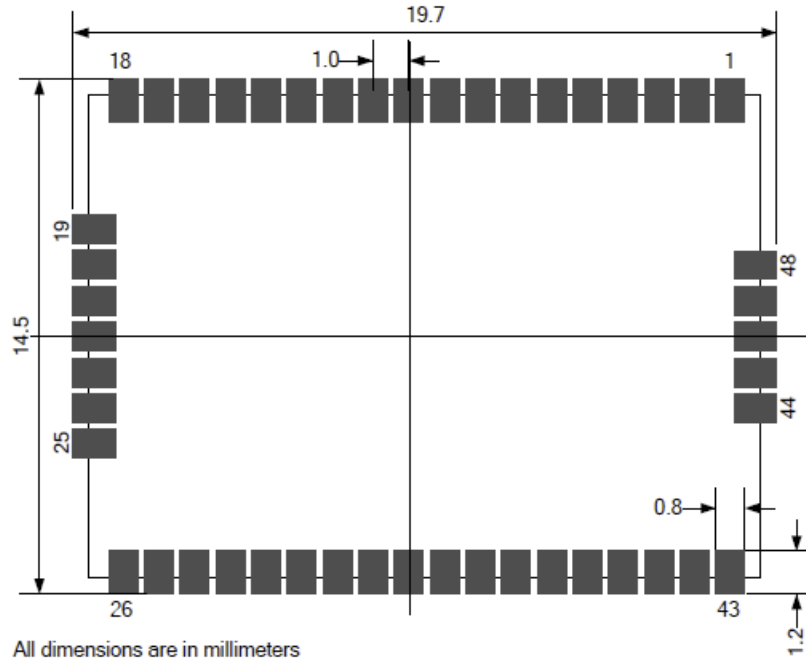
RMLORAB M3 Form factor Pinout Assignment

4. Physical Characteristics

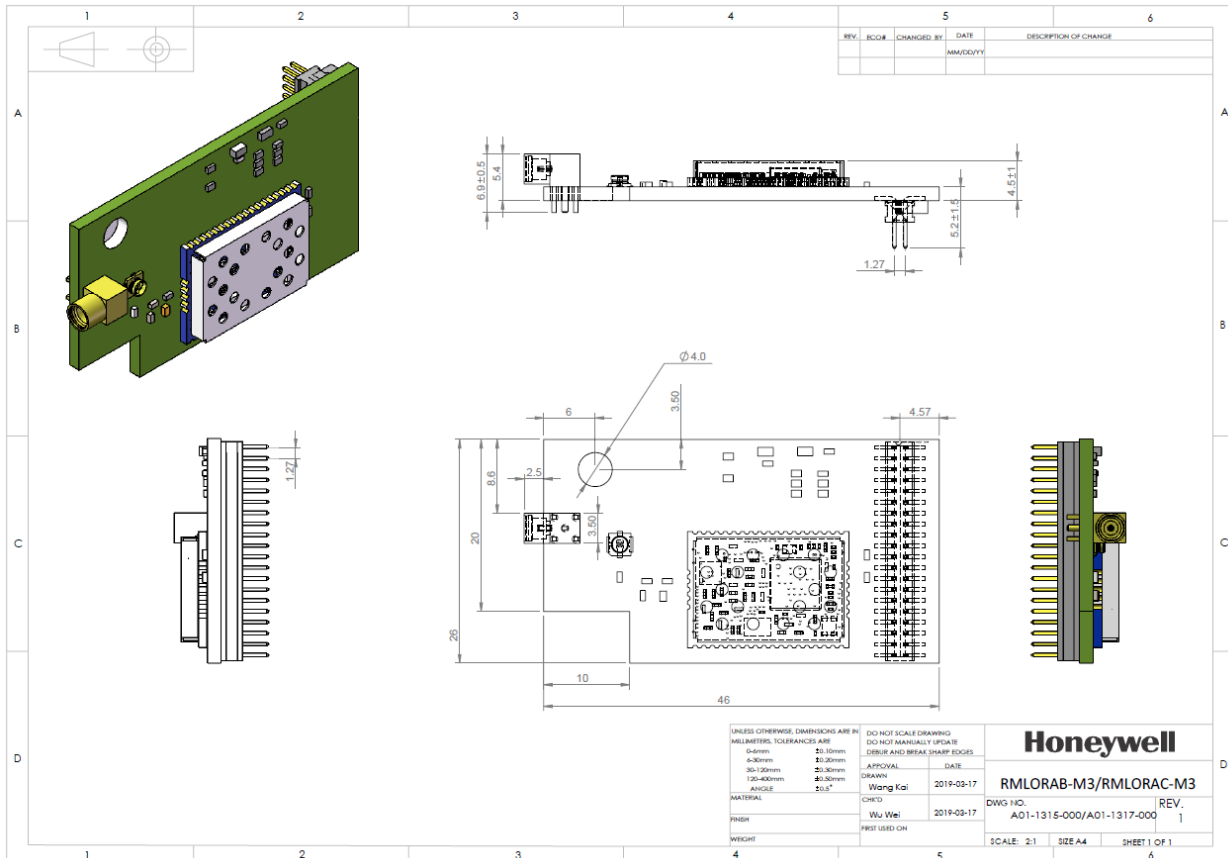
Parameters	Range	Unit	Condition
Size ①	18.8x13.5x3	mm	M5 form factor
Size ②	46x26x9	mm	M3 form factor
Operation Temperature Range	-40 to +85	°C	
Operation Relative Humidity Range	5~95%		



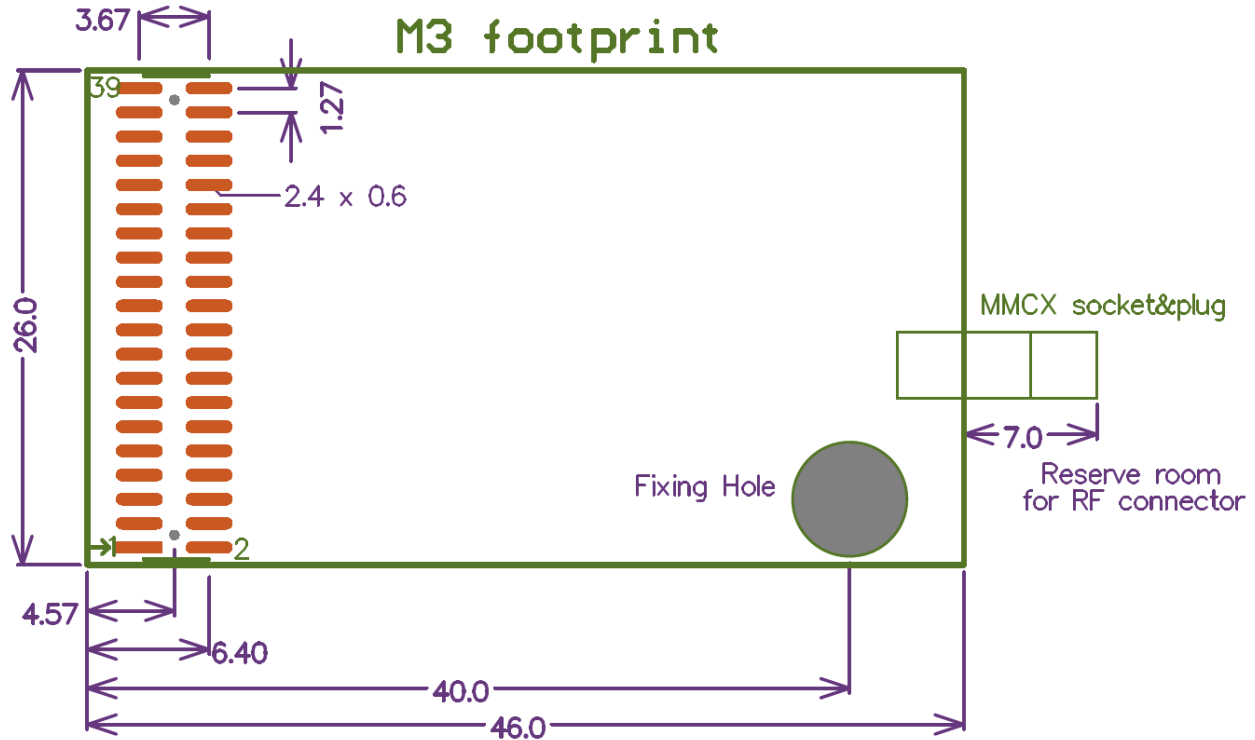
RMLORAB-M5 drawing



RMLORAB-M5 footprint



RMLORAB-M3 drawing



RMLORAB-M3 footprint

5. Certification information

Region	Certification Status	Certificate	Remark
FCC/IC/RED	On going		
SRRC	TBD		
ROHS	TBD		

6. IS Parameters

Parameter item	Value/Status
Voltage Enhancement circuits or Boost circuit	Not contain
Total Inductance with tolerance(M5 form factor)	<2.5uH

Total Inductance with tolerance(M3 form factor)	<2.5uH
Total Capacitance with tolerance(M5 form factor)	<5uF
Total Capacitance with tolerance(M3 form factor)	<12uF
Resistor minimum package and its value, Minimum Resistance and its package	Resistor minimum package is 0402, its value is 1.02Kohm; Minimum Resistance is 1.02Kohm, Its package is 0402;
Surface less than 20mm ² chipset Thermal Resistance	All less than 215 K/W or 215 °C/W
Other parts T4 requirements	Meet T4

7. Order Information

PN	Description	Status	Remark
A01-1314-000	RMLORAB-M5	Trial-run Beta	Euro, NA, Russia and India band
A01-1315-000	RMLORAB-M3	Trial-run Beta	Euro, NA, Russia and India band
A01-1316-000	RMLORAC-M5	Trial-run Alpha	433MHz/470-510MHz
A01-1317-000	RMLORAC-M3	Trial-run Alpha	433MHz/470-510MHz

8. Application note

1. Place a 4.7uF and 0.1uF power decoupling capacitors as close as Pin24/Pin25 on M5 RMLORAB modem;
2. M5 RMLORAB modem Pin45 RF Out should place a DC block capacitor and a Pi shape antenna matching circuit before RF connector, circuit control impedance 50ohm, RF trace keep 5mm distance from VCC trace.



9. Warning

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.
2. Caution: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
3. 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.

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.

NOTE: 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 radio transmitter IC: 20969-RMLORAB has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Gain of antenna: -0.32dBi max for FPC antenna, 3.0dBi max for dipole antenna

Type of antenna: 50ohm, FPC or dipole antenna.

Le présent émetteur radio IC: 20969-RMLORAB a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Gain d'antenne: -0,32dbi max pour l'antenne FPC, 3,0dbi max pour l'antenne dipolaire

Type d'antenne: 50ohm, 50ohm, antenne FPC ou dipôle.

Information for the OEM Integrators

This device is intended for OEM integrators only. Please see the full grant of equipment document for restrictions.

Label Information to the End User by the OEM Integrators

If this certified module is installed inside the host device, then the outside of the host must be labeled with "Contains FCC ID: **SU3RMLORAB** and IC: **20969-RMLORAB**".



10. The requirement for KDB 996369 D03

1 List of applicable FCC rules

FCC Part 15. 247.

2 Summarize the specific operational use conditions

None.

3 Limited module procedures

The module is a single module, so this requirement is not applicable to the product.

4 Trace antenna designs

NA.

5 RF exposure considerations

After evaluation, the SAR requirement is deemed to be satisfied without test. Please check the report for detail information.

6 Antennas

Antenna 1: -0.32dBi, FPC antenna

Antenna 2: 3.0dBi, dipole antenna

Antenna 3: 3.0dBi, dipole antenna

Antenna 4: 3.0dBi, dipole antenna

Antenna 5: 1.8dBi, dipole antenna

7 Label and compliance information

If this certified module is installed inside the host device, then the outside of the host must be labeled with "Contains FCC ID: SU3RMLORAB and IC: 20969-RMLORAB".

8 Information on test modes and additional testing requirements

The host manufacturer can use the software of SSCOM V5.13.1 to make the transmit continuously.

9 Additional testing, Part 15 Subpart B disclaimer

The module only complies with the FCC Part 15.247. If the module is installed in the host device, the host manufacturer is responsible for the compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. For example, if the host manufacturer markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the host manufacturer shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.