Radiocrafts
Embedded Wireless Solutions

RC1701-MBUS4
RC1701HP-MBUS4
RC1701VHP-MBUS4

Wireless M-Bus High power N Mode RF Transceiver Module EN 13757-4:2013)

Product Description

The RC1701HP-MBUS is part of a compact surface-mounted Wireless M-Bus module family that measures only 12.7 x 25.4 x 3.7 mm. The module contains a communication controller with embedded wireless M-Bus protocol software supporting the new EN13757-4:2018 Mode N and is pre-certified for operation under the European radio regulations.

Applications

- Wireless M-Bus
- Automatic Meter Reading (AMR)
- Advanced Metering Infrastructure (AMI)
- Gas and Water meters
- Electricity meters
- Heat meters, Heat cost allocators
- Readers and concentrators
- Asset Tracking and Tracing

Note: The number of LGA pads differ from photo, see page 8 for details

Features

- Embedded Wireless M-Bus protocol supporting EN 13757-4:2018 mode N
- High power, long range (20 km Line-Of-Sight)
- Industry leading Wireless M-Bus protocol stack
- Completely shielded
- Pin compatible with the RC11XX (including –MBUS, –KNX, -TM and RC232 versions) and 2.4 GHz versions RC2500/2500HP from Radiocrafts
- 12.7 x 25.4 x 3.7 mm compact module for SMD mounting
- No external components except antenna
- Antenna tuning feature
- 2.8 – 3.6 V supply voltage, ultra low power modes
- Conforms with EU RED directive (EN 300 220, EN 301 489, EN 60950)
- EN300-220 Cat 1 receiver option for optimum selectivity
- Configurable LBT as defined in CIG UNI/TS 11291-11-4
- Output power table in 3 dB steps from -27 dBm to +27/30 dBm as defined in CIG UNI/TS 11291-11-4

Quick Reference Data

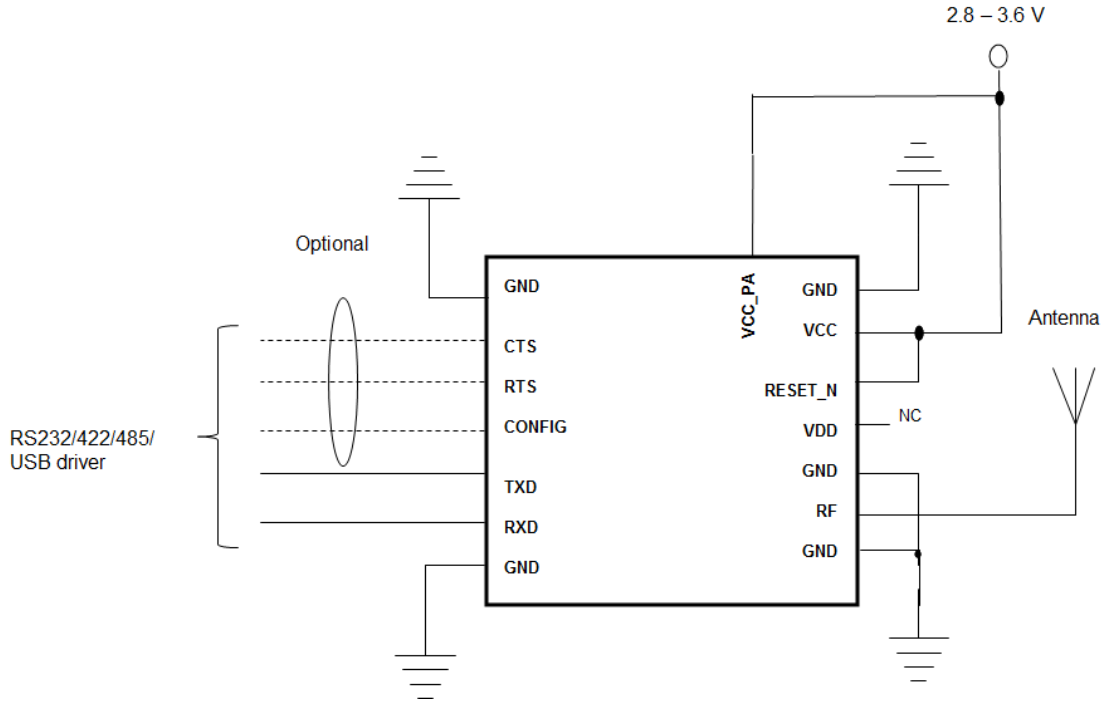
Parameter	RC1701HP-MBUS	Unit
Frequency bands	169.4 – 169.8125	MHz
Number of channels	41	
Data rate	2.4, 4.8, 6.4, 19.2	kbps
Max output power	+ 27/30 dBm	dBm
Sensitivity, (2.4 / 4.8 / 19.2)	-119/-115/-107	dBm
Supply voltage	2.8 – 3.6	Volt
Current consumption, RX /IDLE	31.7	mA
Current consumption, TX (+27/30 dBm)	403 / 703	mA
Current consumption, SLEEP	Max 2.0	uA
Temperature range	-30 to +85	°C

Part Name Overview

RC module	Max output power	VCC_PA
RC1701-MBUS4*	+15 dBm	N.C
RC1701HP-MBUS4	+27 dBm	VCC
RC1701VHP-MBUS4*	+30 dBm	VCC

*Available on request

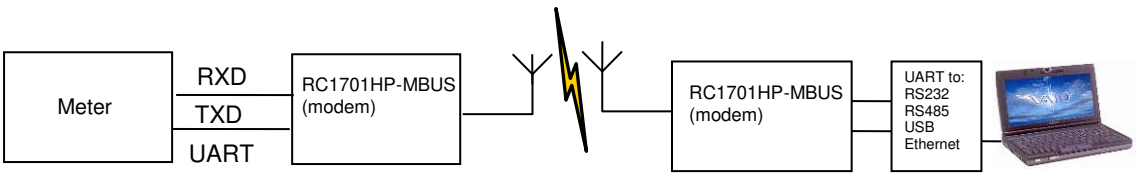
Typical application Circuit:



Note that the VCC_PA pin supply the internal power amplifier only while the rest of the internal block runs on VCC. They can be connected together or separated using individual supply. For the RC1701 variant the VCC_PA pin can be left open.

Wireless M-Bus Modem

The standard RC1701HP-MBUS module acts like a wireless M-Bus modem with a UART interface. The embedded protocol transmits and receives the wireless M-Bus data packets based on application messages from an external source (the meter or the concentrator). The module is configured through its UART interface using a simple command set. Configuration parameters are stored in non-volatile memory. The module can be set in Sleep mode with very low current consumption, and wake up on a UART command. See MBUS User Manual for details about the embedded wireless MBUS protocol from Radiocrafts.



RF Frequency, Output Power Levels and Data Rates

The following table shows the available RF channels and their corresponding frequencies, nominal output power levels and available data rates (Bold is default setting). The combination of frequency and data rate is specified in EN 13757-4:2018.

Model	RF channel [MHz]	Output power	Data rate
RC1701HP-MBUS4	1: 169.406250 2: 169.418750 **3: 169.431250** 4: 169.443750 5: 169.456250 6: 169.468750 7: 169.412500 8: 169.437500 9: 169.462500 10: 169.437500 11: 169.481500 12: 169.494000 13: 169.506500 14: 169.519000 15: 169.531500 16: 169.544000 17: 169.556300 18: 169.568800 19: 169.581300 20: 169.593800 21: 169.606300 22: 169.618800 23: 169.631425 24: 169.643800 25: 169.656300 26: 169.668800 27: 169.681300 28: 169.693800 29: 169.706300 30: 169.718800	**PA_TABLE_EXTENDED = 0** **PA_POWER=1-5** **5: +27 dBm** 4: +24 dBm 3: +21 dBm 2: +18 dBm 1: +14 dBm **PA_POWER=1-5** **PA_TABLE_EXTENDED > 0** 20: N.A 19: +27 dBm 18: +24 dBm 17: +21 dBm 16: +18 dBm 15: +15 dBm 14: +12 dBm 13: +9 dBm 12: +6 dBm 11: +3 dBm 10: 0 dBm 9: -3 dBm 8: -6 dBm 7: -9 dBm 6: -12 dBm 5: -15 dBm 4: -18 dBm 3: -21 dBm 2: -24 dBm 1: -27 dBm	**1: 2.4 kbps GFSK** 2: 4.8 kbps GFSK 4: 19.2 kbps 4GFSK 5: 6.4 kbps
RC1701-MBUS4*	31: 169.731300 32: 169.743800 33: 169.756300 34: 169.768800 35: 169.781300 36: 169.793925 37: 169.806425 38: 169.625050 39: 169.675050 40: 169.725050 41: 169.775175	**5: +15 dBm** 4: +10 dBm 3: +6 dBm 2: 0 dBm 1: -40 dBm	**1: 2.4 kbps GFSK** 2: 4.8 kbps GFSK 4: 19.2 kbps 4GFSK 5: 6.4 kbps

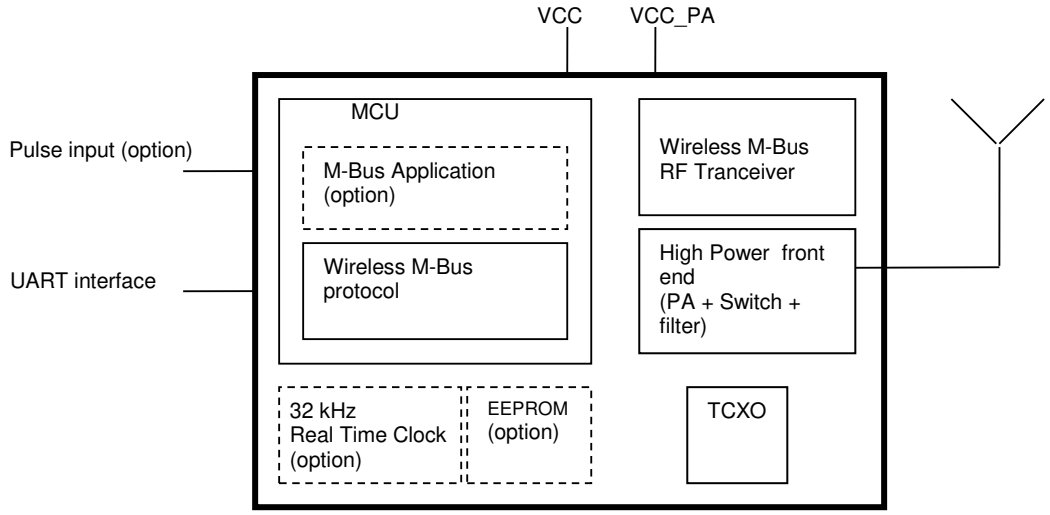
Model	RF channel [MHz]	Output power	Data rate
RC1701VHP-MBUS4*		**PA_TABLE_EXTENDED = 0** **PA_POWER=1-5:** **5: +30 dBm** 4: +27 dBm 3: +24 dBm 2: +21 dBm 1: +18 dBm **PA_POWER=1-5** **PA_TABLE_EXTENDED>0:** 20: +30 dBm 19: +27 dBm 18: +24 dBm 17: +21 dBm 16: +18 dBm 15: +15 dBm 14: +12 dBm 13: +9 dBm 12: +6 dBm 11: +3 dBm 10: 0 dBm 9: -3 dBm 8: -6 dBm 7: -9 dBm 6: -12 dBm 5: -15 dBm 4: -18 dBm 3: -21 dBm 2: -24 dBm 1: -27 dBm	**1: 2.4 kbps GFSK** 2: 4.8 kbps GFSK 4: 19.2 kbps 4GFSK 5: 6.4 kbps

*Available on request

For more details on changing the RF channel, output power or M-Bus mode, refer to the MBUS User Manual.

For details about configuring MBUS4 to CIG UNI/TS 11291-11-4, refer to AN019.

Block Diagram



Circuit Description

The module contains a communication controller with embedded Wireless M-Bus protocol software and a high performance RF transceiver. As an option the module can support a real time clock oscillator and EEPROM memory.

The communication controller handles the radio packet protocol, the UART interface and controls the RF transceiver. Data to be sent by the host is received at the RXD pin and buffered in the communication controller. The data packet is then assembled with preamble, start-of-frame delimited (SOF), manufacturer ID, unique address information and CRC check sums before it is transmitted on RF.

The RF transceiver modulates the data to be transmitted on RF frequency, and demodulates data that are received. Digital signal processing technology is used to enhance sensitivity and selectivity.

The high power front end amplifies the signal up to +27 dBm (+30 for RC1701VHP) and advanced filtering topology is included to suppress harmonics and spurs.

Received data are checked for correct CRC by the communication controller. If no CRC errors were detected, the data packet is sent to the host on the TXD line. The data format is configurable, and optionally an RSSI value (signal strength of received packet) can be added to the message.

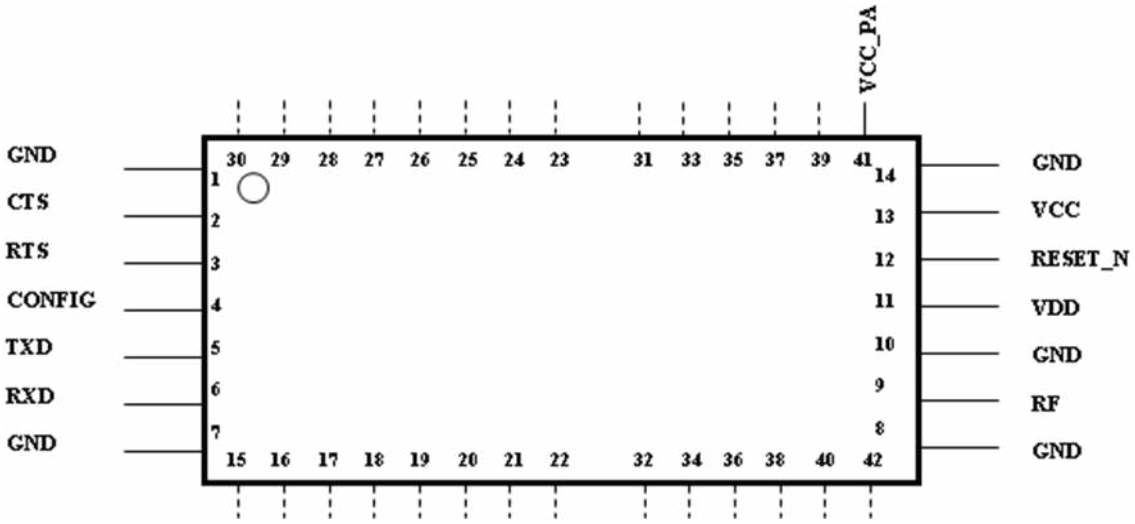
The asynchronous UART interface consists of RXD and TXD. Optionally CTS or RTS can be used for hardware handshake flow control.

When a 00h value is sent as the first byte (replacing the Length byte), or the CONFIG pin is asserted, the module enters configuration mode and the communication controller interprets data received on the RXD pin as configuration commands. There are commands to change the radio channel, the output power, etc. Permanent changes of the configuration is also possible and are then stored in internal non-volatile memory (Flash).

The supply voltage is connected to the VCC and VCC_PA pin. The module contains an internal voltage regulator for the RF transceiver and can therefore operate over a wide supply voltage range.

The module can be set in Sleep mode by UART commands to reduce the power consumption to a minimum.

Pin Assignment

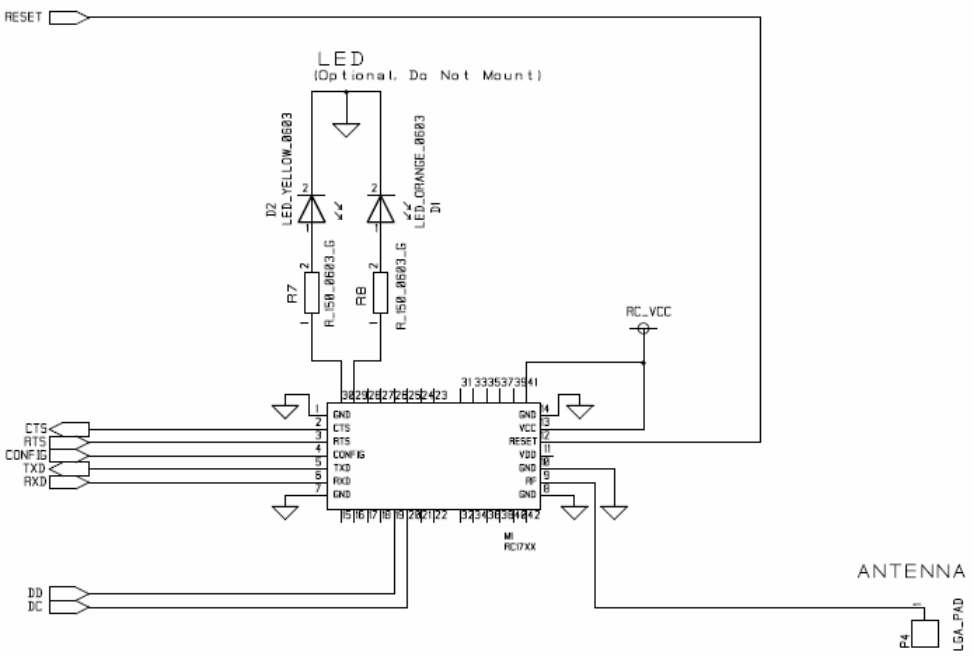


Pin Description

Pin no	Pin name	Description
1	GND	System ground
2	CTS/RXTX	UART Clear to Send / RXTX control (RS485)
3	RTS/SLEEP	UART Request to Send
4	CONFIG	Configuration Enable. Active low.
5	TXD	UART TX Data
6	RXD	UART RX Data
7	GND	System ground
8	GND	System ground
9	RF	RF I/O connection to antenna
10	GND	System ground
11	VDD	Not Connected, Internal Regulator Output
12	Reset	RESET_N. Active Low
13	VCC	Supply voltage input. Internally regulated.
14	GND	System ground
41	VCC_PA	Supply voltage input for Power Amplifier stage. VCC_PA can be connected together with VCC or separated using individual supply.
29-30	LED	Optional for LED control.
15-28	I/O	For future use and test status pin, Do not connect
31-40	I/O	For future use and test status pin, Do not connect
42	I/O	For future use and test status pin, Do not connect

Application circuit

A typical application circuit is shown where a MCU is connected to the Radiocrafts module. In normal cases the UART (CTS/RTS is optional) and RESET line is connected to a host MCU running the application. CONFIG is optional since a UART command can replace the CONFIG pin on the MBUS4 modules. Pin 29/30 are LED drivers and D1/D2 can be mounted (optional) for debugging (State information).



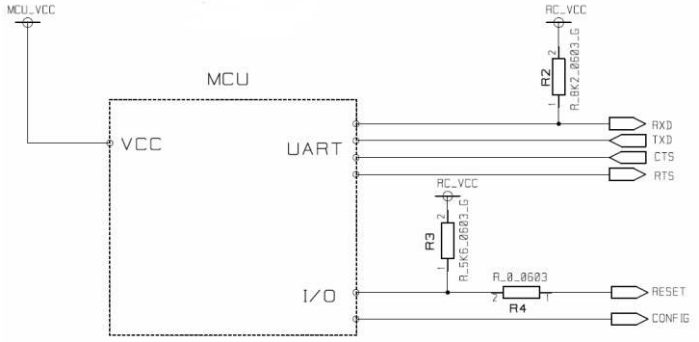
MCU considerations

Some additional external components is needed depending on MCU output driver properties connected to the Radiocrafts module.

If the RESET is driven by a push-pull output, an additional 0 ohm series resistor (R4) shall be inserted as shown in the figure, to allow an external programmer used for firmware upgrade to assert Reset low. During firmware upgrade, R4 must in this case be removed.

In noisy surroundings and where RESET is not driven by a push-pull output, it is recommended to add an external pull-up on RESET using a 5k6 resistor (R3). If the pull-up is stronger the external programmer used for firmware upgrade will not be able to assert RESET low.

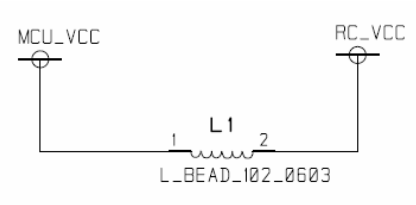
In noisy surroundings and where RXD is not driven by a push-pull output, it is recommended to add an external pull-up on RXD using a 5k6 resistor (R3).



Power Supply

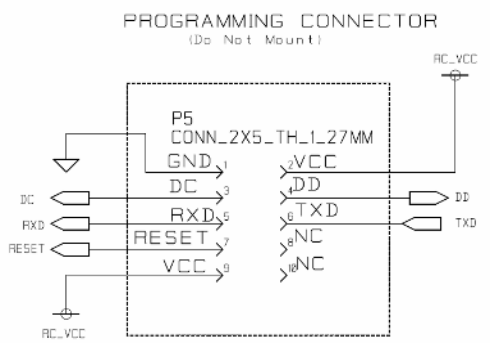
Noisy external circuitry may under certain scenarios affect the transmitted signal on RC1701HP-MBUS4 and precaution should be taken for EU RED conformity. Example of circuits that can generate noise on the RC1701HP-MBUS4 transmitted spectrum may be DC/DC converters and some level converters like RS232 and RS485. To increase spectrum margin it is important to add an EMI filter bead (L1) on the VCC pin of the RC1701HP-MBUS4 module. Alternatively, the RC1701HP-MBUS4 may be powered (RC_VCC) from a separate voltage regulator. This will ensure that potential switching noise is filtered out from the power supply (RC_VCC) to the RC1701HP-MBUS4.

Component	Manufacturer	Part number
EMI filter bead (L1), 1500 mA	Murata	Ordering code BLM18SG331TN1



Programming Interface

For future firmware updates and possible custom variants it is recommended to include a 2x5 pins programming connector to the module programming pins. The connector should be a 1.27 mm pitch pin-row (same pitch in both directions), SMD or through-hole version, with the connections shown below. RXD/TXD lines is not in use for firmware upgrade, but is included on spare pins on the connector for debugging purposes.



Antenna Connection

The antenna should be connected to the RF pin. The RF pin is matched to 50 Ohm. If the antenna connector is placed away from the module at the motherboard, the track between the RF pin and the connector should be a 50 Ohm transmission line.

On a two layer board made of FR4 the width of a microstrip transmission line should be 1.8 times the thickness of the board, assuming a dielectric constant of 4.8. The line should be run at the top of the board, and the bottom side should be a ground plane.

Example: For a 1.6 mm thick FR4 board, the width of the trace on the top side should be 1.8 x 1.6 mm = 2.88 mm.

The simplest antenna to use is the quarter wave whip antenna. A quarter wave whip antenna above a ground plane yields 37 Ohm impedance and a matching circuit for 50 Ohm are usually not required.

A PCB antenna can be made as a copper track where the ground plane is removed on the back side. The rest of the PCB board should have a ground plane as large as possible, preferably as large as the antenna itself, to make it act as a counterweight to the antenna. If the track is shorter than a quarter of a wavelength, the antenna should be matched to 50 ohms.

The length of a quarter wave antenna at 169.4 MHz is typ. 42 cm long. A more normal antenna at 169 MHz is a helical design. The embedded antenna tuning feature inside the module will make the antenna tuning to a customer specific design easy. See white papers and application note on antenna at Radiocrafts web page.

Regulatory Compliance Information

The use of RF frequencies and maximum allowed RF power is limited by national regulations. The RC1701HP-MBUS has been designed to comply with the RED directive 2014/53/EU.

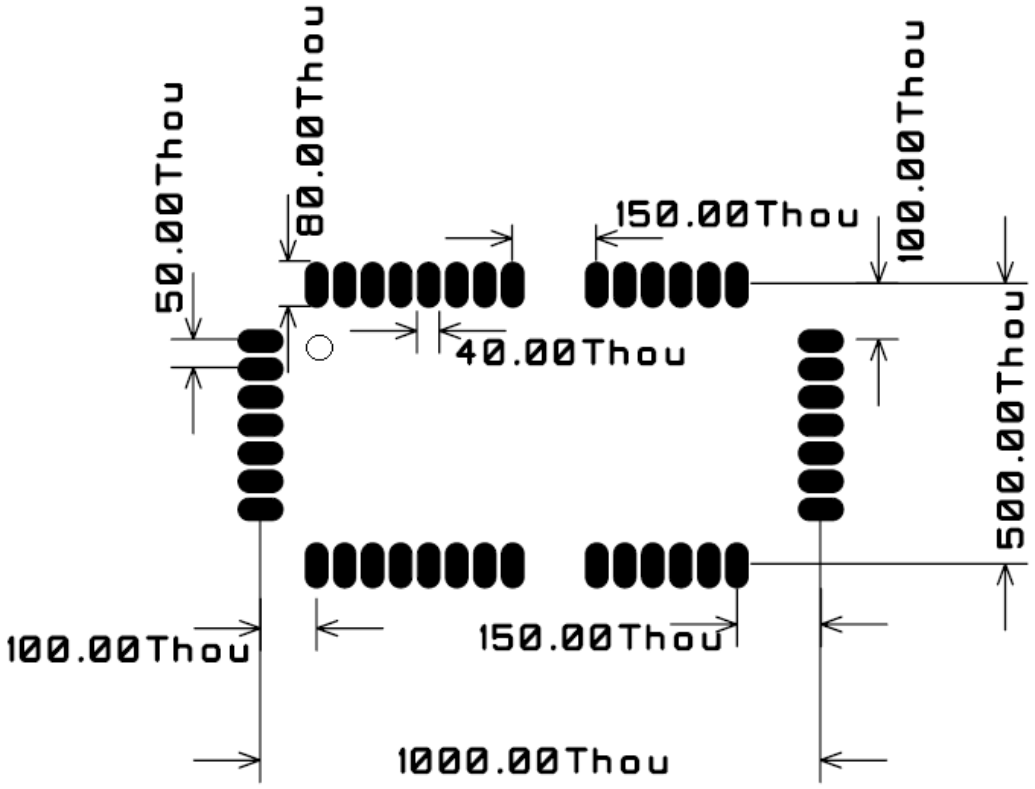
According to RED directives, it is the responsibility of Radiocrafts' customers (i.e. RC1701HP-MBUS end user) to check that the host product (i.e. final product) is compliant with RED essential requirements. The use of a CE marked radio module can avoid re-certification of the final product, provided that the end user respects the recommendations given by Radiocrafts.

A Declaration of Conformity is available from Radiocrafts on request. The DoC is based on an antenna gain of 0 dBi or lower in band and < -3 dBi below 120 MHz.

The relevant regulations are subject to change. Radiocrafts AS do not take responsibility for the validity and accuracy of the understanding of the regulations referred above. Radiocrafts only guarantee that this product meets the specifications in this document. Radiocrafts is exempt from any responsibilities related to regulatory compliance.

PCB Layout Recommendations

The recommended layout pads for the module are shown in the figure below. All dimensions are in thousands of an inch (mil). The circle in upper left corner is an orientation mark only, and should not be a part of the copper pattern.



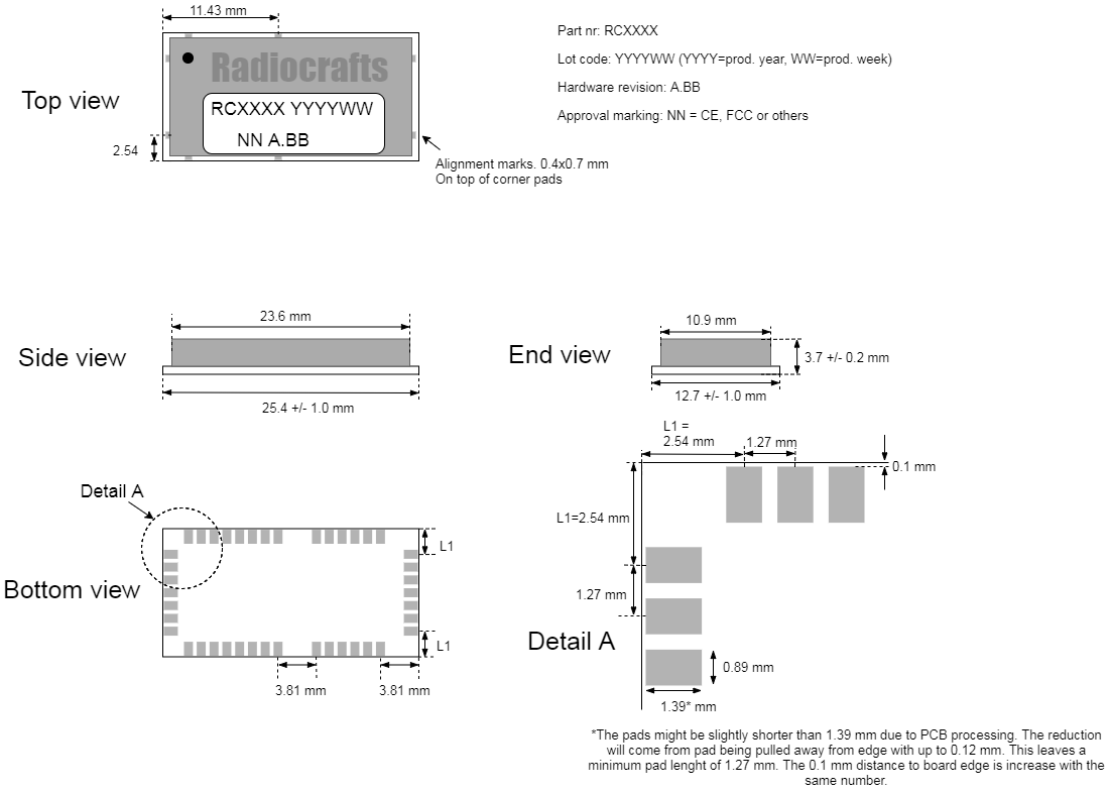
A PCB with two or more layers and with a solid ground plane in one of the inner- or bottom layer(s) is recommended. All GND-pins of the module shall be connected to this ground plane with vias with shortest possible routing, one via per GND-pin.

On the back side of the module there are several vias and pads. These vias and pads shall not be connected, and the area underneath the module should be covered with solder resist. If any routing or vias is required under the module, the routing and vias must be covered with solder resist to prevent short circuiting to the module bottom side vias and pads. It is recommended that vias are tented.

Reserved pins should be soldered to the pads but the pads must be left floating.

Note that Radiocrafts technical support team is available for schematic and layout review of your design.

Mechanical Drawing



*The pads might be slightly shorter than 1.39 mm due to PCB processing. The reduction will come from pad being pulled away from edge with up to 0.12 mm. This leaves a minimum pad lenght of 1.27 mm. The 0.1 mm distance to board edge is increase with the same number.

Mechanical Dimensions

The module size is 12.7 x 25.4 x 3.7 mm

Carrier Tape and Reel Specification

Carrier tape and reel is in accordance with EIA Specification 481.

Tape width	Component pitch	Hole pitch	Reel diameter	Units per reel
44 mm	16 mm	4 mm	13”	Max 1000

Soldering Profile Recommendation

JEDEC standard IEC/JEDEC J-STD-020B (page 11 and 12), Pb-Free Assembly is recommended.

The standard requires that the heat dissipated in the "surroundings" on the PCB is taken into account. The peak temperature should be adjusted so that it is within the window specified in the standard for the actual motherboard.

Aperture for paste stencil is normally areal-reduced by 20-35%, please consult your production facility for best experience aperture reduction.

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply voltage, VCC Supply voltage, VCC_PA	-0.3 -0.3	3.8 3.8	V V
Voltage on any pin	-0.3	VCC+0.3V	V
Input RF level		10	dBm
Storage temperature	-50	150	°C
Operating temperature	-40	85	°C

Caution ! *ESD sensitive device. Precaution should be used when handling the device in order to prevent permanent damage.*

Under no circumstances the absolute maximum ratings given above should be violated. Stress exceeding one or more of the limiting values may cause permanent damage to the device.

Fresh 3.6V Li batteries normally have a higher open circuit voltage than the nominal 3.6V, but can still be used to power the module as long as it is not exceeding the absolute maximum rating (3.8V). When the module operates in IDLE/RX/TX the loaded battery voltage will usually drop below 3.6V, which is inside the operation voltage range (2.8V – 3.6V).

Electrical Specifications

T=25°C, VCC = 3.3V, VCC_PA=3.3V if nothing else stated.

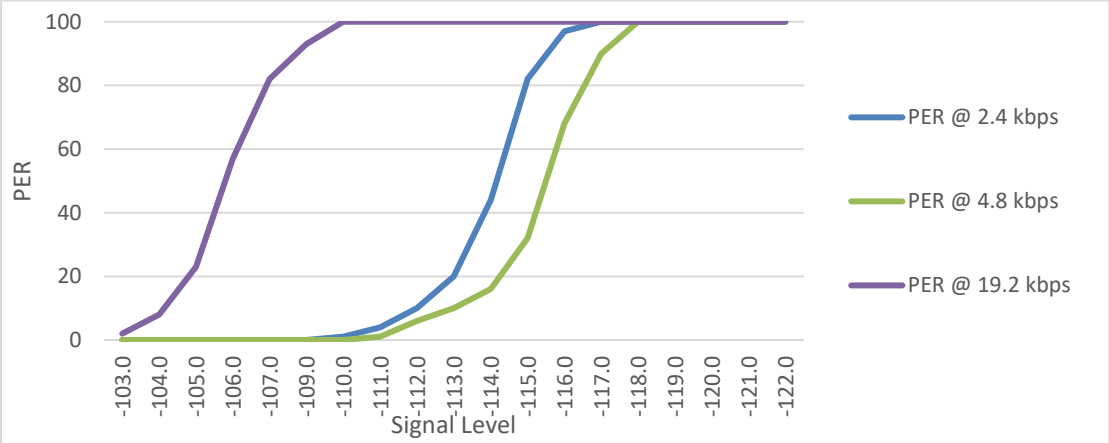
Parameter	Min	Typ.	Max	Unit	Condition / Note
Operating frequency	169.4		169.8125	MHz	
Number of 12.5 kHz channels Number of 25 kHz channels Number of 50 kHz channels		33 3 5			25 kHz channels for legacy use vs older standard
Input/output impedance		50		Ohm	
Data rate		2.4 4.8 6.4 19.2		kbit/s	2GFSK 2GFSK 4GFSK 4GFSK
Frequency tolerance 12.5 kHz channels 50 kHz channels			+/-1.5 +/-4.25	kHz	Including 10 years of aging.
Frequency stability aging			1 5	ppm/year ppm/ 10 year	Starting after 10 years
Transmit power RC1701HP-MBUS4 RC1701VHP-MBUS4 RC1701-MBUS4		27 30 15	27.5 30.5 16	dBm	Typical values are for default settings
FSK deviation 2.4 kbps 4.8 kbps 6.4 kbps 19.2 kbps		+/- 2.4 +/- 2.4 +/- 3.2 / 1.06 +/- 7.2 / 2.4		kHz	
Adjacent channel power: 12.5 kHz channels 25 and 50 kHz channels			<-20 <-37	dBm	
Spurious emission, TX < 1 GHz > 1 GHz Restricted bands			 -36 -30 -54	dBm	Restricted bands: 47 MHz – 74 MHz 87.5 MHz – 118 MHz 174 MHz – 230 MHz 470 MHz – 862 MHz

Parameter	Min	Typ.	Max	Unit	Condition / Note
Sensitivity: 2.4 kbps 4.8 kbps 19.2 kbps	 -118 -114 -106	 -119 -115 -107		dBm	Measured at 1% BER / 80% PER of 20 byte packets. Note! Sensitivity drops 4 dB when Cat 1 is Enabled.
Adjacent channel rejection		64		dB	
Alternate channel selectivity		66		dB	
Image channel rejection		66		dB	
Blocking / Interferer rejection / desensitization +/- 1 MHz +/- 2 MHz (Cat 1.5 / 1) +/- 10 MHz (Cat 1.5 / 1)	 30 35 / 84 60 / 84	 82 83 / 86.2 89		dB	Wanted signal 3 dB above sensitivity level, CW interferer. Minimum numbers corresponds to class 1.5/1 receiver requirements in EN300220.
Saturation		+10		dBm	
Input IP3		-14		dBm	
Spurious emission, RX			-57	dBm	
Supply voltage, VCC VCC_PA	 2.8 2.5	 3.3 3.3	 3.6 3.8	 V V	
Current consumption, RX/IDLE VCC VCC_PA		 31 0.3	 32	 mA uA	Apply over entire supply voltage range
RC1701HP Current, TX: RF_POWER=5, +27 dBm RF_POWER=4, +24 dBm RF_POWER=3, +20 dBm RF_POWER=2, +17 dBm RF_POWER=1, +14 dBm PA_TABLE_EXTENDED: 1-19 1: -27 dBm 2: -24 dBm 3: -21 dBm 4: -18 dBm 5: -15 dBm 6: -12 dBm 7: -9 dBm 8: -6 dBm 9: -3 dBm 10: 0 dBm 11: 3 dBm 12: 6 dBm 13: 9 dBm 14: 12 dBm 15: 15 dBm 16: 18 dBm 17: 21 dBm 18: 24 dBm 19: 27 dBm		VCC_PA+VCC 402.7 mA 268.8 mA 181.2 mA 140.2 mA 107.7 mA 29.9 mA 29.9 mA 30.3 mA 31.2 mA 32.5 mA 34.7 mA 37.2 mA 41.2 mA 47.3 mA 54.0 mA 68.4 mA 82.1 mA 77.0 mA 101.8 mA 107.7 mA 140.2 mA 181.2 mA 268.8 mA 402.7 mA		mA	Tested when load = 50 ohm. Note! PA_TABLE_EXT=1-2 and 13/14 will not give 3 dB step due to HW limitations.

Parameter	Min	Typ.	Max	Unit	Condition / Note
RC1701HP TX Current vs Load for RF_POWER=5 (+27 dBm): Load=50 ohm Load=RC kit Antenna Load=Open Load=Short Load pull test for VSWR < 2.0: Load=100 ohm Load=25 ohm Load=50 ohm || 62 nH Load=50 ohm || 15 pF Load=82 ohm || 120 nH Load=82 ohm || 7.5 pF		 402.7 mA 522.1 mA 694.9 mA 219.2 mA 499.3 mA 347.8 mA 340.9 mA 543.0 mA 401.9 mA 586.4 mA			 The Demo Board has a 50 Ohm output directly from the RF module. There is no antenna match on the board.
RC1701VHP Current, TX: RF_POWER=5, +30 dBm RF_POWER=4, +27 dBm RF_POWER=3, +24 dBm RF_POWER=2, +21 dBm RF_POWER=1, +18 dBm PA_TABLE_EXTENDED: 1-20 1: -27 dBm 2: -24 dBm 3: -21 dBm 4: -18 dBm 5: -15 dBm 6: -12 dBm 7: -9 dBm 8: -6 dBm 9: -3 dBm 10: 0 dBm 11: 3 dBm 12: 6 dBm 13: 9 dBm 14: 12 dBm 15: 15 dBm 16: 18 dBm 17: 21 dBm 18: 24 dBm 19: 27 dBm 20: 30 dBm		VCC_PA+VCC 703.1 mA 493.2 mA 366.7 mA 273.0 mA 204.4 mA 29.4 mA 30.3 mA 31.9 mA 34.4 mA 37.1 mA 41.8 mA 47.8 mA 57.4 mA 70.4 mA 86.9 mA 124.4 mA 124.4 mA 124.4 mA 133.1 mA 160.9 mA 204.4 mA 273.0 mA 366.7 mA 493.2 mA 703.1 mA			Tested when load = 50 ohm. Note! PA_TABLE_EXT=11-13 will not give 3 dB step due to HW limitations.
RC1701VHP TX Current vs Load for RF_POWER=5 (+27 dBm): Load=50 ohm Load=RC kit Antenna Load=Open Load=Short Load pull test for VSWR < 2.0: Load=100 ohm Load=25 ohm Load=50 ohm || 62 nH Load=50 ohm || 15 pF Load=82 ohm || 120 nH Load=82 ohm || 7.5 pF		 703.1 mA 930.0 mA 1194.7 mA 427.6 mA 787.7 mA 657.0 mA 592.2 mA 860.3 mA 698.9 mA 947.5 mA			 The Demo Board has a 50 Ohm output directly from the RF module. There is no antenna match on the board.
RC1701 Current, TX: RF_POWER=5, +15 dBm		VCC_PA+VCC 57 mA			
Current consumption, SLEEP VCC VCC_PA		 0.60 0.02	 2.0 1.0	 uA uA	
Digital I/O Input logic level, low Input logic level, high Output logic level, low (1µA) Output logic level, high(-1µA)	 70 % 0 TBD		 30 % TBD VCC	 V	 Of VCC Of VCC

Parameter	Min	Typ.	Max	Unit	Condition / Note
RESET pin Input logic level, low Input logic level, high	 70 %		 30 %	 V	Minimum 250 ns pulse width
UART Baud Rate tolerance		+/- 2		%	UART receiver and transmitter
Configuration memory write cycles	1000				The guaranteed number of write cycles using the 'M' command is limited

Packet Error Rate



Document Revision History

Document Revision	Changes
1.00	First release
1.10	-Added data and features for CIG UNI/TS 11291-11-4 (LBT Cat 1, PA_TABLE_EXTENDED) -pin number corrected -P_out vs Current for all steps added -Load pull vs current in TX added -Application circuit info update -Product status changed to Full Production
1.11	- Absolut max voltage vs Max Supply voltage clarification - PER vs Signal Level curves added
1.20	Updated with RED certification and new channels/data rate. Added antenna tuning feature.
1.21	Updated Mechanical drawing and height information. Please refer to Hardware PCN for revision history.

Product Status and Definitions

Current Status	Data Sheet Identification	Product Status	Definition
	Advance Information	Planned or under development	This data sheet contains the design specifications for product development. Specifications may change in any manner without notice.
	Preliminary	Engineering Samples and First Production	This data sheet contains preliminary data, and supplementary data will be published at a later date. Radiocrafts reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
X	**No Identification Noted**	**Full Production**	**This data sheet contains final specifications. Radiocrafts reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.**
	Obsolete	Not in Production	This data sheet contains specifications on a product that has been discontinued by Radiocrafts. The data sheet is printed for reference information only.

Disclaimer

Radiocrafts AS believes the information contained herein is correct and accurate at the time of this printing. However, Radiocrafts AS reserves the right to make changes to this product without notice. Radiocrafts AS does not assume any responsibility for the use of the described product; neither does it convey any license under its patent rights, or the rights of others. The latest updates are available at the Radiocrafts website or by contacting Radiocrafts directly.

As far as possible, major changes of product specifications and functionality, will be stated in product specific Errata Notes published at the Radiocrafts website. Customers are encouraged to check regularly for the most recent updates on products and support tools.

Trademarks

RC232™ is a trademark of Radiocrafts AS. The RC232™ Embedded RF Protocol is used in a range of products from Radiocrafts. The protocol handles host communication, data buffering, error check, addressing and broadcasting. It supports point-to-point, point-to-multipoint and peer-to-peer network topologies.

All other trademarks, registered trademarks and product names are the sole property of their respective owners.

Life Support Policy

This Radiocrafts product is not designed for use in life support appliances, devices, or other systems where malfunction can reasonably be expected to result in significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. Radiocrafts AS customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Radiocrafts AS for any damages resulting from any improper use or sale.

Radiocrafts Technical Support

Knowledge base:	https://radiocrafts.com/knowledge-base/
Application notes library:	https://radiocrafts.com/resources/application-notes/
Whitepapers:	https://radiocrafts.com/resources/articles-white-papers/
Technology overview:	https://radiocrafts.com/technologies/
RF Wireless Expert Training:	https://radiocrafts.com/resources/rf-wireless-expert-training/

Contact Radiocrafts

Sales requests: https://radiocrafts.com/contact/