Radiocrafts
Embedded Wireless Solutions

RC17xxHP-RC232

Ultra Narrow Band High Power RF Module at 169/433/444/458/463/467/868 MHz

Product Description

The RC17xxHP are a family of compact surface-mounted modules that measure only 12.7 x 25.4 x 3.7 mm. The module contains a communication controller with embedded RC232 software and is pre-certified for operation under the European regulations (for applicable bands). Custom variants can be offered in dedicated bands within the 169 - 870 MHz frequency range. How to use the embedded RC232 protocol is described in the RC17xxHP-RC232 User Manual.

Applications

- Industrial remote controls
- Long range sensor applications
- Automatic Meter Reading
- Asset Tracking
- Telemetry stations
- Fleet management

Features

- Long range, high reliability
- Ultra narrowband, high-performance radio
- High sensitivity and high selectivity
- High blocking properties
- High RF Power, long range (up to 20 km Line-Of-Sight)
- Completely shielded module
- Pin compatible with the low cost family 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
- 2.8 – 3.6 V supply voltage (additional 5V required for 433-868 MHz HP versions with setting +27 dBm)
- Ultra low power modes
- Conforms with EU RED directive (EN 300 220, EN 301 489, EN 60950)

Quick Reference Data

Parameter	RC17xxHP-RC232	Unit
Frequency bands	169/433/444/458/463/467/868	MHz
Data rate	1.2 -100	kbps
Max output power	+ 27 dBm	dBm
Sensitivity, (1.2 kbps)	-118	dBm
Supply voltage VCC	2.8 – 3.6	Volt
Supply voltage Internal PA	VCC_PA*	
Current consumption, RX /IDLE	31,7	mA
Current consumption, TX (+27 dBm)	407	mA
Current consumption, SLEEP	Max 2.0	uA
Temperature range	-30 to +85	°C

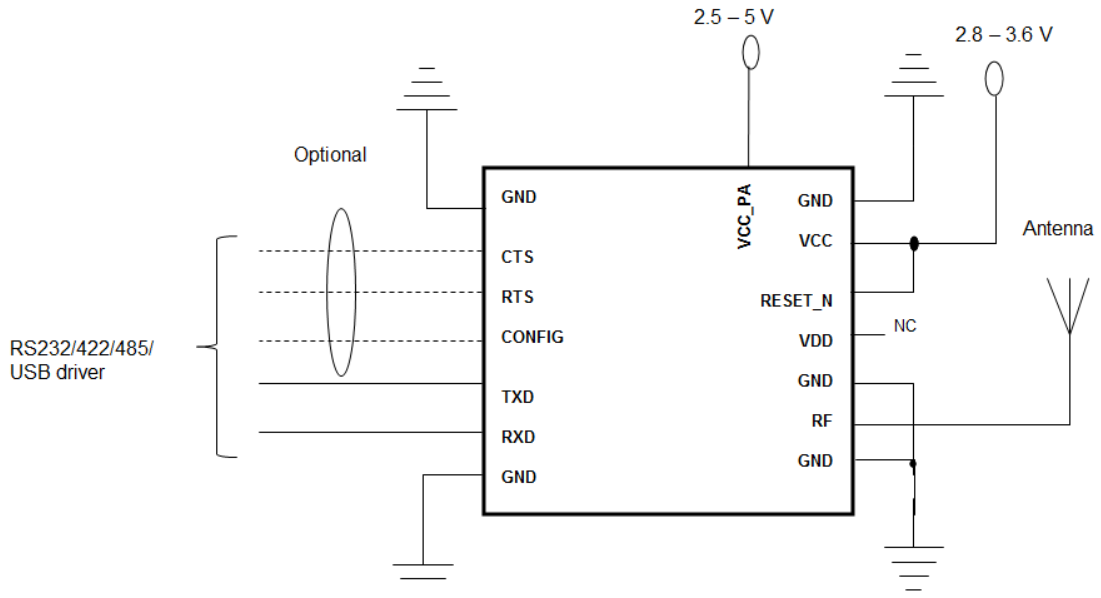
*Voltage range on VCC_PA depends on module variant.

Part Name Overview

RC module	Frequency bands	Max output power	VCC_PA
RC1701HP-RC232	169 MHz	+27 dBm	VCC (3.3V)
RC1740HP-RC232	433 / 444 MHz	+27 dBm	5V
RC1760HP-RC232	458 / 463 / 467 MHz	+27 dBm	5V
RC1780HP-RC232	868 MHz	+27 dBm	5V
*RC1701-RC232**	169 MHz	+15 dBm	Not connect
*RC1740-RC232**	433 / 444 MHz	+15 dBm	Not connect
*RC1760-RC232**	458 / 463 / 467 MHz	+15 dBm	Not connect
*RC1780-RC232**	868 MHz	+15 dBm	Not connect

*Low Power variant 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. If VCC_PA is connected together with VCC, the max output power is reduced to +24 dB for all modules except RC1701HP that support +27 dBm at VCC_PA = 3.3 V. For all low power variant the VCC_PA pin can be left open.

Quick Introduction to the RC232 embedded protocol

How do I transmit data?

Send your data to the RXD pin on the module. Use the UART format with settings (19200, 8, 1, N, no flow control). Up to 127 of payload bytes are buffered in the module. The module will transmit the data when

- the max packet length is reached
- the unique end character is sent
- the modem timeout limit is reached

The packet length, end character and timeout limit are configurable in-circuit.

How do I receive data?

Any received data packet with correct address and check sum will be sent on the TXD pin using the same UART format as for transmit.

What about the antenna?
In most cases a simple quarter wavelength wire or a PCB track will do. Connect a piece of wire to the RF pin with length corresponding to the quarter of a wavelength. For space limited products, contact Radiocrafts and we will recommend the best antenna solution for your application.

How do I change the RF channel or any other parameter?
To change configurable parameters, assert the CONFIG pin, and send the command string using the same serial interface as for transmitting data. Parameters can be changed permanently and stored in non-volatile memory in the module.

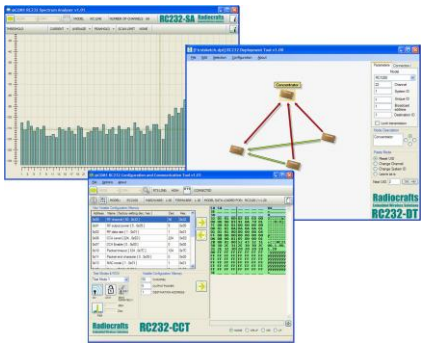
RC232™ Embedded Protocol

The module offers a buffered packet radio in the RC232™ embedded protocol. Using the buffered packet radio mode, all data to be sent is stored in the module before they are transmitted by the RF circuitry. Likewise, when data is received they are stored in the module before they are sent to the host. This allows the communication controller to add address information and to do error check of the data. In buffered mode the UART interface is used to communicate with the host.

The embedded protocol, configuration commands and configuration memory is described in the RC17xxHP-RC232 User Manual. This protocol is used in a wide range of RF modules available from Radiocrafts. Please refer to the latest revision of the RC232 User Manual for feature details.

RCTools

RCTools is a powerful and easy to use PC suite that helps you during test, development and deployment of the RC17xxHP-RC232. Visit www.radiocrafts.com for a free download and full documentation.



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).

Model	Data rate	Channel	Modulation
RC17xxHP-RC232	1: TBD		
*RC17xx-RC232**	2: 0.3 kbit/s	12.5 kHz	2GFSK
	3: 0.6 kbit/s	12.5 kHz	2GFSK
	4: 1.2 kbit/s	12.5 kHz	2GFSK
	5: 2.4 kbit/s	12.5 kHz	2GFSK
	6: TBD		
	7: 4.8 kbit/s	12.5 kHz	2GFSK
	8: 9.6 kbit/s	12,5 kHz	4GFSK
	9: 9.6 kbit/s	25 kHz	2GFSK
	10: 19.2 kbit/s	50 kHz	4GFSK
	11: TBD		
	12: 38.4 kbit/s	100 kHz	2GFSK
	13: 50 kbit/s	100 kHz	2GFSK
	14: 76.8 kbit/s	200 kHz	2GFSK
	15: 100 kbit/s	200 kHz	2GFSK

*Available on request

Model	Output power
RC17xxHP-RC232	**5: +27 dBm**
	4: +24 dBm
	3: +20 dBm
	2: +17 dBm
	1: +14 dBm
*RC17xx-RC232**	**5: +15 dBm**
	4: +12 dBm
	3: +7 dBm
	2: +4 dBm
	1: +0 dBm

*Available on request

The use of RF frequencies, maximum allowed RF power and duty-cycles are limited by national regulations. The RC17xxHP-RC232 and RC17xx-RC232 are complying with the applicable directives within the European Union when used within these limitations.

Note: Max output power (+27 dBm) @ 868 MHz are in EU limited by ERC/REC 70-03 to operate in sub band 869.40 – 869.65 MHz. RC1780HP has 10 high power channels (ch 57-66) inside this sub band that allow max output power (+27 dBm).

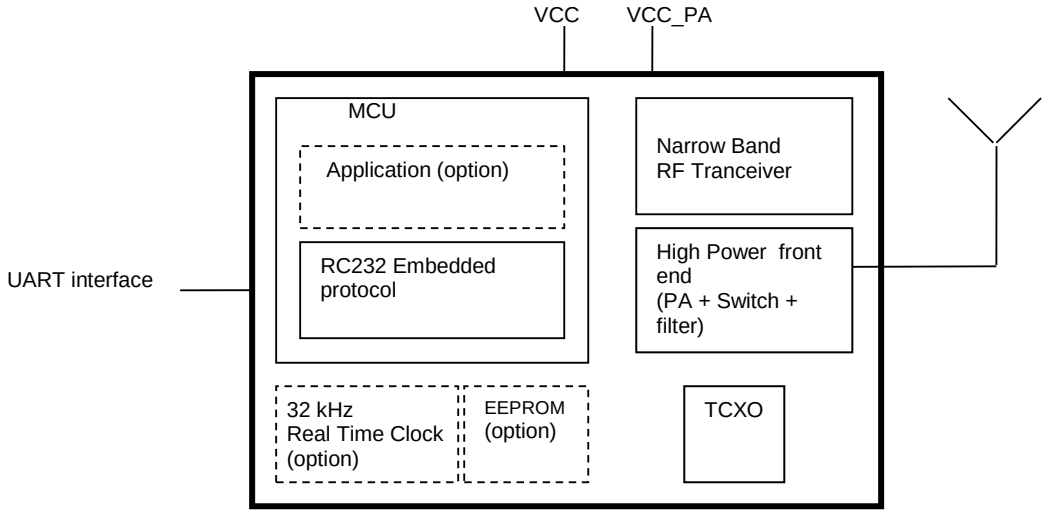
RC1780HP high power (+27 dBm) channels in EU:

Channel 57	869.412500 MHz
Channel 58	869.437500 MHz
Channel 59	869.462500 MHz
Channel 60	869.487500 MHz
Channel 61	869.512500 MHz (default channel)
Channel 62	869.537500 MHz
Channel 63	869.562500 MHz
Channel 64	869.587500 MHz
Channel 65	869.612500 MHz
Channel 66	869.637500 MHz

Model	RF channel
RC1701HP-RC232 *RC1701-RC232**	**1: 169.406250 MHz** 2: 169.418750 MHz 3: 169.431250 MHz 4: 169.443750 MHz 5: 169.456250 MHz 6: 169.468750 MHz 7: 169.412500 MHz 8: 169.437500 MHz 9: 169.462500 MHz 10: 169.437500 MHz
RC1740HP-RC232 *RC1740-RC232**	433.0525 + n*0.025 MHz n = RF_CHANNEL for n=**1** to 69 429.45 for RF_CHANNEL = 70 439.675 + (n-70)*0.025 MHz n = RF_CHANNEL for n=71 to 82 444.000000 MHz for RF_CHANNEL = 83 444.050000 MHz for RF_CHANNEL = 84 444.400000 MHz for RF_CHANNEL = 85 444.450000 MHz for RF_CHANNEL = 86 444.550000 MHz for RF_CHANNEL = 87 444.675000 MHz for RF_CHANNEL = 88 444.700000 MHz for RF_CHANNEL = 89 444.250000 MHz for RF_CHANNEL = 90 433.950000 MHz for RF_CHANNEL = 91 434.000000 MHz for RF_CHANNEL = 92 434.050000 MHz for RF_CHANNEL = 93
RC1760HP-RC232 *RC1760-RC232**	458.512500 + (n-1)*0.0125 MHz n = RF_CHANNEL for n=**1** to 39 457.4875 + (n-39)*0.0125 MHz n = RF_CHANNEL for n=40 to 119 462.9875 + (n-119)*0.0125 MHz n = RF_CHANNEL for n=120 to 230 467.4875 + (n-230)*0.0125 MHz n = RF_CHANNEL for n=231 to 239
RC1780HP-RC232 *RC1780-RC232**	867.9875 + n*0.025 MHz n = RF_CHANNEL for n=1 to 80 870.075000 MHz for RF_CHANNEL = 81 870.550000 MHz for RF_CHANNEL = 82 870.600000 MHz for RF_CHANNEL = 83 870.650000 MHz for RF_CHANNEL = 84 **Default RF_CHANNEL=61** See note page 4 on high power channels in EU

*Available on request

Block Diagram



Circuit Description

The module contains a communication controller with embedded RC232 protocol software and a high performance narrow band RF transceiver. As an option the module can support a real time clock oscillator and EEPROM memory for application specific products.

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), 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 and advanced filtering topology is included to suppress harmonics and spurs.

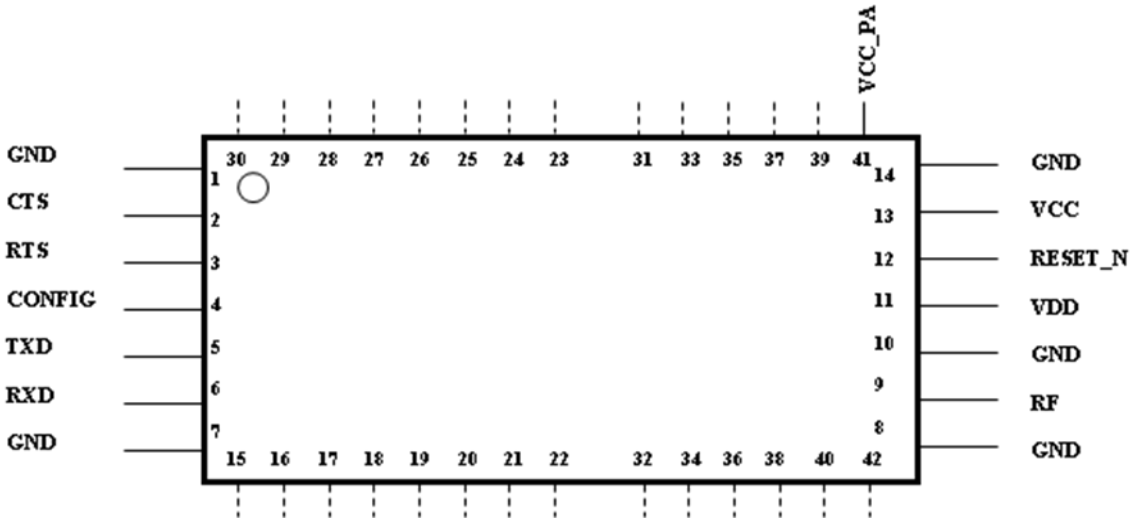
Received data are checked for correct CRC by the communication controller. If no CRC errors were detected, the data packet is sent to the host on the TXD line. The data format is configurable, and optionally an RSSI value (signal strength of received packet) can be added to the message.

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

When 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 or pin commands to reduce the power consumption to a minimum.

Pin Assignment



Pin Description

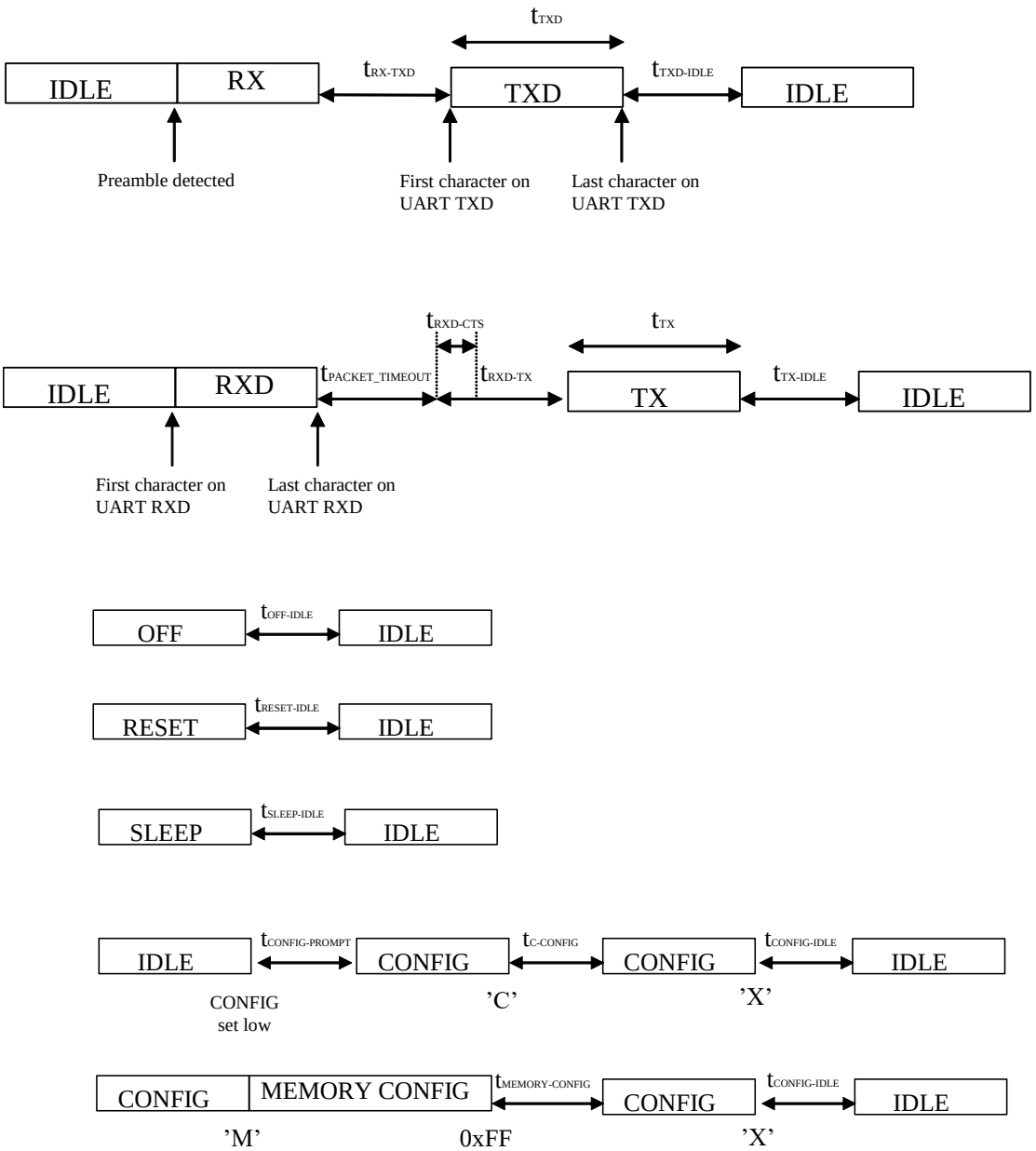
Pin no	Pin name	Description
1	GND	System ground
2	CTS/RXTX	UART Clear to Send / RXTX control (RS485)
3	RTS/SLEEP	UART Request to Send
4	CONFIG	Configuration Enable. Active low.
5	TXD	UART TX Data
6	RXD	UART RX Data
7	GND	System ground
8	GND	System ground
9	RF	RF I/O connection to antenna
10	GND	System 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. Connect to 5V or VCC for RC17x0HP and leave open for RC17xx. When VCC_PA connected to VCC (3.3V) for RC17x0HP the max output power is limited to +24 dBm. For RC1701HP the VCC_PA has the same voltage range as VCC, and support +27 dBm at 3.3 V.
15-22 23-30 31-40 42	I/O	For future use and test status pin, Do not connect

Timing Information

The figure and table below shows the timing information for the module when changing between different operating states in the embedded RC232 protocol.

The IDLE state is the normal state where the module search for preamble on the air and wait for a character to be received on the UART. RXD is the state when receiving characters from the host filling up the internal buffer. TX state is when the data is transmitted on the air. RX state is when data is received from the air after preamble detection. TXD is the state where the received data is sent to the host on the UART.

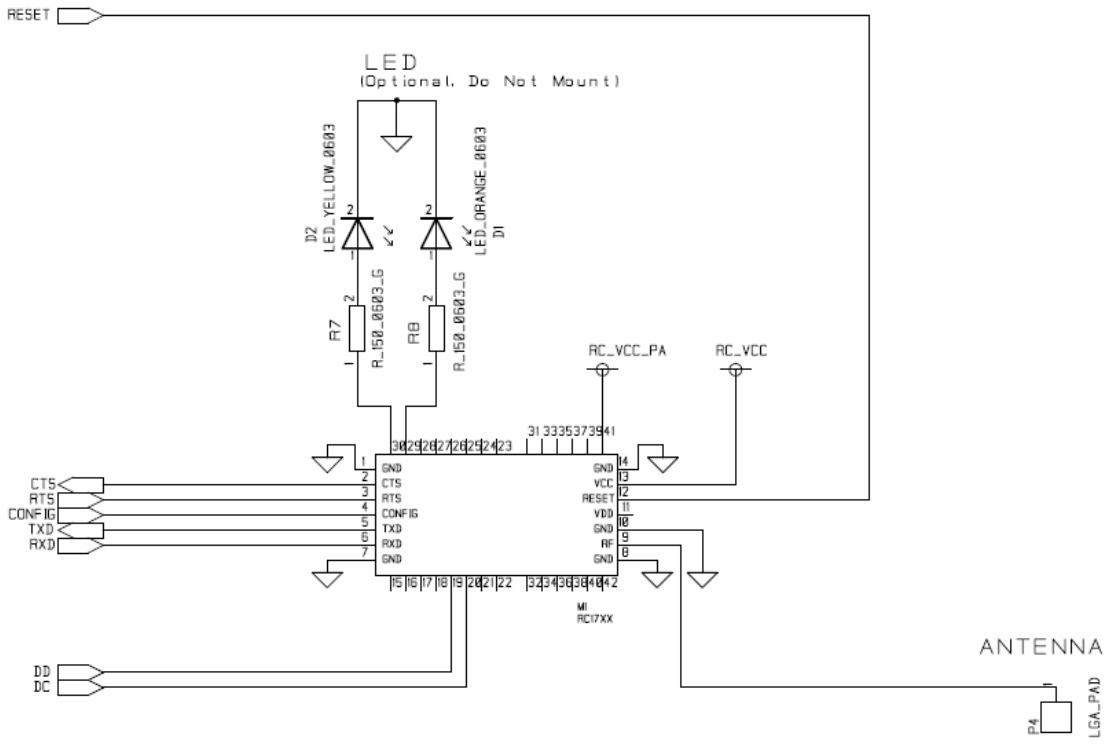
CONFIG is the state entered by asserting the CONFIG pin and used during parameter configuration, while MEMORY CONFIG is the sub-state entered by the 'M' command where the configuration memory is being programmed. Note the limitation on maximum number of write cycles using the 'M' command, see Electrical Specifications.



Symbol	Value	Description / Note
t_{RX-TXD}	180 us	Time from last byte is received from the air until first character is sent on the UART
t_{TXD}	Min 590 us	t_{TXD} = # bytes received x 590 us/char (10 bits at 19.2 kBd + 70 us delay per character)
$t_{TXD-IDLE}$	900 us	Time from last character is sent on the UART until module is in IDLE mode (ready for RXD and RX)
$T_{RXD-CTS}$	20 us	Time from last character is received by the UART (including any timeout) until CTS is activated
t_{RXD-TX}	960 us	Time from last character is received by the UART (including any timeout) until the module sends the first byte on the air.
$T_{TX-IDLE}$	960 us	Time from last character is sent on the air until module is in IDLE mode (ready for RXD and RX)
$t_{OFF-IDLE}$	3.2 ms	
$t_{RESET-IDLE}$	3.0 ms	
$t_{SLEEP-IDLE}$	1.28 ms	
$t_{CONFIG-PROMPT}$	590 us	Time from CONFIG pin is set low until prompt (“>”)
$t_{C\#-CONFIG}$	1.1 ms	Delay after channel-byte is sent until prompt (“>”). (For other commands like ’M’, ’T’ there is no delay but immediate prompt)
$t_{MEMORY-CONFIG}$	62 ms	In this period the internal flash is programmed. *Do not reset, turn the module off, or allow any power supply dips in this period as it may cause permanent error in the Flash configuration memory. After 0xFF the host should wait for the ‘>’ prompt before any further action is done to ensure correct re-configuration.*
$T_{CONFIG-IDLE}$	1.42 ms	
t_{TX}	Min 12 ms	t_{TX} = # bytes to send x 1.67 ms/byte (at 4.8 kbit/s) + 2 bytes preamble, sync + 2 bytes address + 2 bytes CRC
T_{RSSI}	20 ms	Time from end of S command to start of RSSI byte received on UART

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 pin is needed to set the RC232 modules into configuration mode. Pin 29/30 are LED drivers and D1/D2 can be mounted (optional) for debugging (State information).



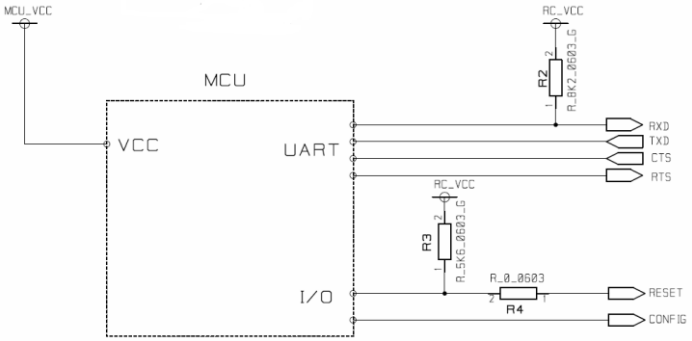
MCU considerations

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).

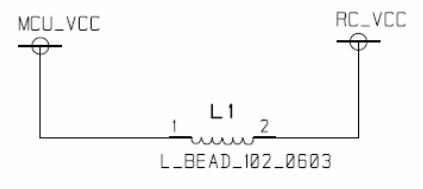


Power Supply

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

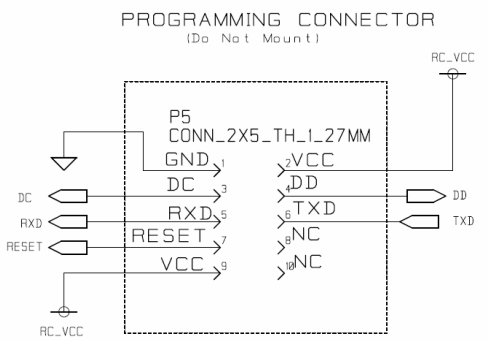
RC1701HP-MBUS4 may be powered (RC_VCC) from a separate voltage regulator. This will ensure that potential switching noise is filtered out from the power supply (RC_VCC) to the RC1701HP-MBUS4.

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.

Regulatory Compliance Information

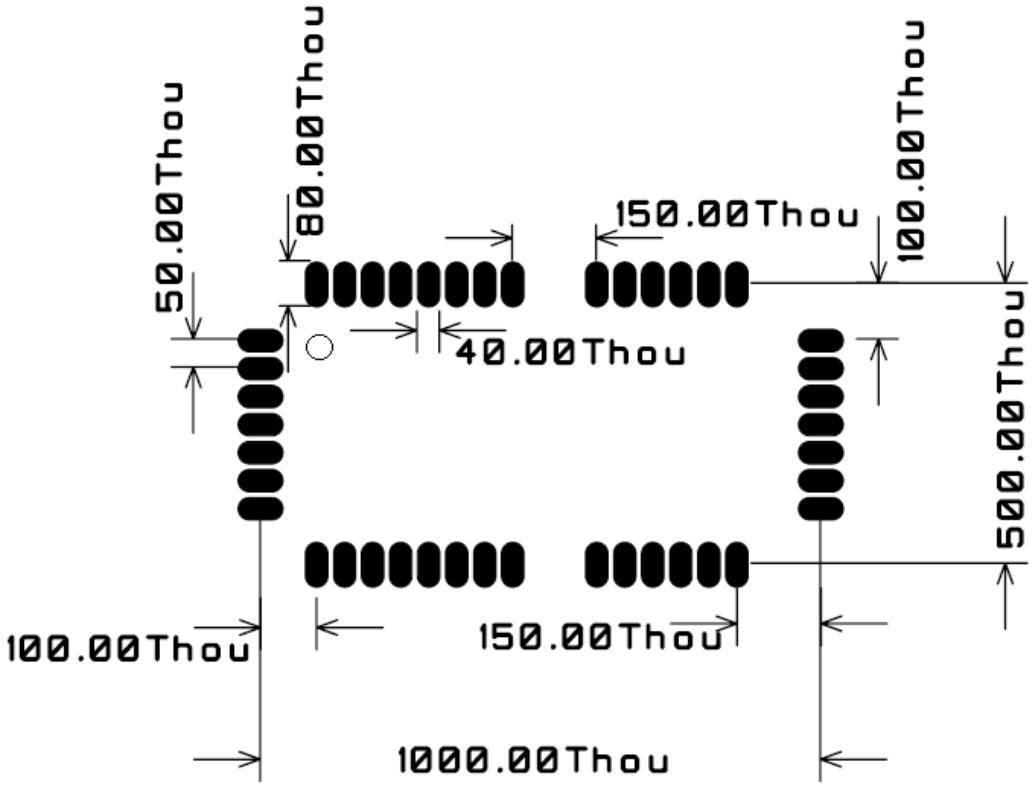
The use of RF frequencies and maximum allowed RF power is limited by national regulations. The RC17xxHP-RC232 has been designed to comply with the RED directive 2014/53/EU when used in European license free bands.

According to RED directives, it is the responsibility of Radiocrafts' customers (i.e. RC17xxHP-RC232 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 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.



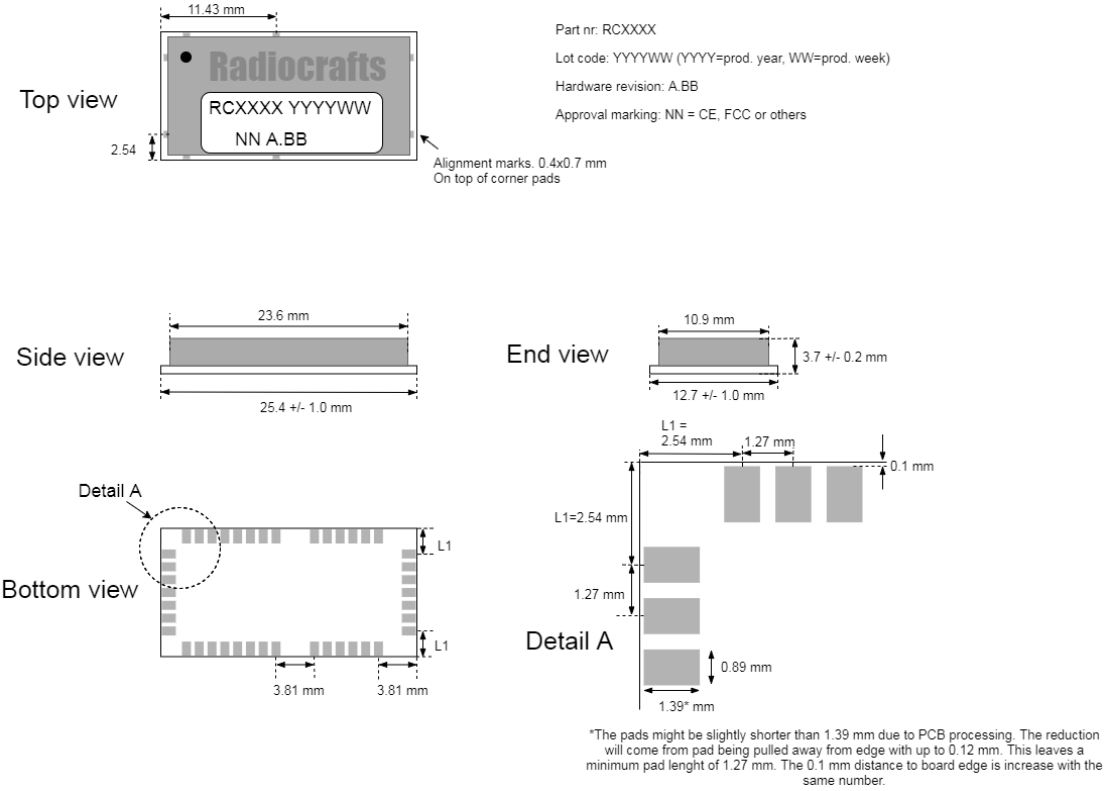
A PCB with two or more layers and with a solid ground plane in one of the inner- or bottom layer(s) is recommended. All GND-pins of the module shall be connected to this ground plane with vias with shortest possible routing, one via per GND-pin.

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 5	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

*VCC_PA=VCC voltage range for RC1701HP-RC232

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.

Electrical Specifications

T=25°C, VCC = 3.3V, VCC_PA=5.0V if nothing else stated.

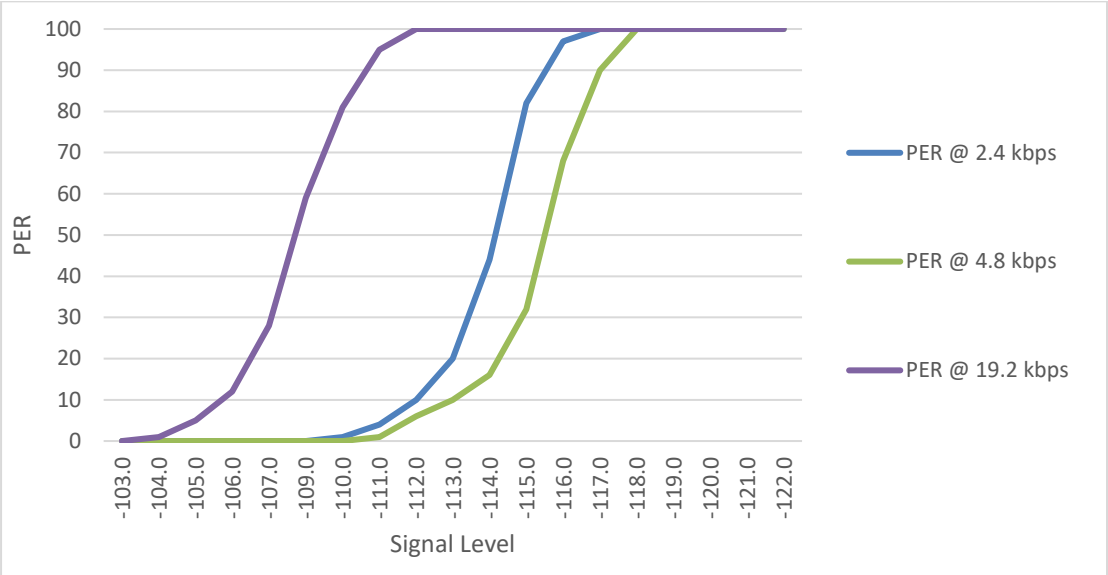
Parameter	Min	Typ.	Max	Unit	Condition / Note
Operating frequency RC1701HP / RC1701 RC1740HP / RC1740 RC1760HP / RC1760 RC1780HP / RC1780	 169.4000 433.0775 457.5000 868.0125	 169.406250 433.077500 458.512500 869.512500	 169.475 444.250 467.600 870.650	MHz	Typ. Is default channel
Number of channels RC1701HP / RC1701 RC1740HP / RC1740 RC1760HP / RC1760 RC1780HP / RC1780		 10 93 239 84			See page 5 for details
Input/output impedance		50		Ohm	
Data rate	0.3	1.2	100	kbit/s	
Frequency tolerance			+/-1.5	ppm	Including 10 years of aging.
Frequency stability aging			1 5	ppm/year ppm/ 10 year	Starting after 10 years
Transmit power RC1701HP-RC232 RC17x0HP-RC232 RC17xx-RC232		 27 27 15	 27.5 27.5 16	dBm	Typical values are for default settings
FSK deviation 1.2 kbps 9.6 kbps 19.2 kbps 50 kbps 100 kbps		 +/- 2.4 +/- 4.8 +/- 7.2 / 2.4 +/- 25 +/- 38.4		kHz	
Adjacent channel power: 12.5 kHz channels 25 and 50 kHz channels			 <-20 <-37	dBm	 See note 1
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: 1.2 kbps 9.6 kbps 19.2 kbps 50 kbps 100 kbps	 -117 -113 -109 -106 -101	 -118 -114 -110 -107 -102		dBm	Measured at 1% BER / 80% PER of 20 byte packets.
Adjacent channel rejection		64		dB	
Alternate channel selectivity		66		dB	
Image channel rejection		66		dB	
Blocking / Interferer rejection / desensitization +/- 1 MHz +/- 2 MHz +/- 10 MHz	 30 35 60	 82 83 89		 dB	Wanted signal 3 dB above sensitivity level, CW interferer. Minimum numbers corresponds to class 2 receiver requirements in EN300220.
Saturation		+10		dBm	
Input IP3		-14		dBm	
Spurious emission, RX			-57	dBm	
Supply voltage, VCC VCC_PA VCC_PA	 2.8 2.5 2.5	 3.3 3.3 3.3	 3.6 5.0 3.8	 V V V	 RC17x0HP RC1701HP
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		VCC+VCC_PA 407 268 173 132 103		mA	Apply over entire VCC supply voltage range when VCC=VCC_PA.
RC1740HP / RC1760HP 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		 VCC_PA / VCC 318/63 248/42 174/37 141/36 134/35		 mA	
RC1780HP 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		VCC_PA / VCC 297/72 234/46 154/41 128/39 128/36		mA	
RC17xx 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
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

Note 1: The RC17x0HP module should be characterized as a wideband system for 25 kHz and wider channels under EN300-220-2 V2.4.1. The 25 kHz narrow band ACP requirement will limit the output power to +22 dBm when

characterised as 25 kHz channel under EN300-220-2. For 12.5 kHz narrow band systems the RC17x0HP complies with ACP up to +27 dBm.

Packet Error Rate



Document Revision History

Document Revision	Changes
1.00	First release
1.10	Data rate table on page 4 changed according to changes in fw rev 1.02.
1.11	New description for application circuit
1.12	- Absolut max voltage vs Max Supply voltage clarification - High power channels at 868 MHz in EU clarification - PER vs Signal Level curves added
1.13	Updated Mechanical drawing and height information. Please refer to Hardware PCN for revision history. Updated regulatory compliance
1.14	- Included timing data that was previously found in RC17xxHP-RC232 User Manual.

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.**
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