

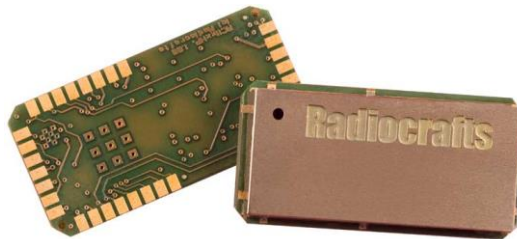
High Performance RF Module for Mioty

Product Description

The RC1882CEF-MIOTY1 module is a compact surface-mounted product that measures only 12.7 x 25.4 x 3.7 mm. The module contains a communication controller with embedded MIOTY protocol software and is pre-certified for operation under the European regulations. Custom variants can be offered with customized functionalities. How to use the embedded MIOTY protocol is described in the MIOTY1 User Manual.

Applications

- Large scale massive LPWAN
- Smart Metering
- Smart City
- Long range sensor applications
- Industry 4.0



Features

- MIOTY compliant
- ETSI technical specification TS 103 357 Low Throughput Network (LTN) Telegram Splitting Ultra Narrowband (TS-UNB)
- Compliant to MIOTY radio protocol
- Massive IoT deployment, > 1.5 M messages/day
- Long range, high reliability
- Ultra-narrowband, high-performance radio
- High sensitivity and high selectivity
- High blocking properties
- Completely shielded module
- Pin compatible with other products from Radiocrafts
- 12.7 x 25.4 x 3.7 mm compact module for SMD mounting
- 2.3 – 3.8 V supply voltage
- Ultra-low power modes for extended battery operation
- Conforms with EU RED directive (EN 300 220, EN 301 489, EN 62368)
- Supports modes EU0, EU1, EU2, and US0 for bidirectional communication

Note: The use of this module in an end-product is subject to an IPR license fee (see Sisvel.com).

Part Name Overview

| Part name | RF Frequency bands | Max output power | VCC |
|------------------|--------------------|------------------|-------|
| RC1882CEF-MIOTY1 | 868 and 916 MHz | 14 dBm | +3.3V |

Quick Reference Data (typical at 3.6V, 868 MHz, 2380 b/s)

| Parameter | RC1882CEF-MIOTY1 | Unit |
|----------------------------------|---------------------|------|
| Frequency band | 866-870, 915-917 | MHz |
| Max output power | 14 | dBm |
| Sensitivity (PER 10 %) @ 2380b/s | -129 | dBm |
| Supply voltage | 2.3- 3.8 | V |
| Current consumption, RX/TX | 6.0 / 25 | mA |
| Current consumption, Shutdown | 1 | uA |
| Operating Temperature | -20 to +70 | °C |

AT commands

The Module operate as a radio modem with serial UART interface, and an AT command set

The AT interface is started automatically on the module when it is started.

The UART must be setup like this:

- UART-TXD = pin 5
- UART-RXD = pin 6
- Default baud rate 115 200 baud/s
- Data bits: 8
- Stop bit: 1
- Parity: none
- Flow control : None

More detailed information on the AT command set is available in the MIOTY1 User Manual.

Bootloader

All modules are supplied with a bootloader. The bootloader is preloaded from Radiocrafts and allows the user to upload new firmware with extended features later.

The bootloader also allows user to program unique encryption keys into the device. These keys are not possible to read out. The bootloader uses the standard UART port and operate at 115 200 Baud. The bootloader is accessible via the Radiocrafts Bootloader Utility.

Pin Assignment

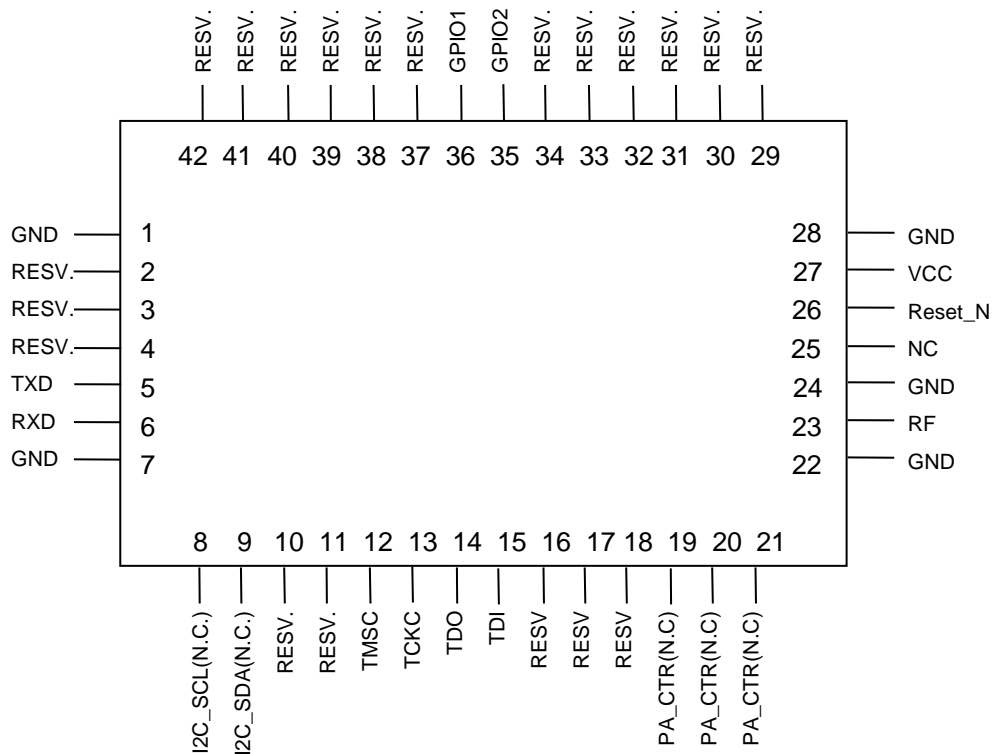


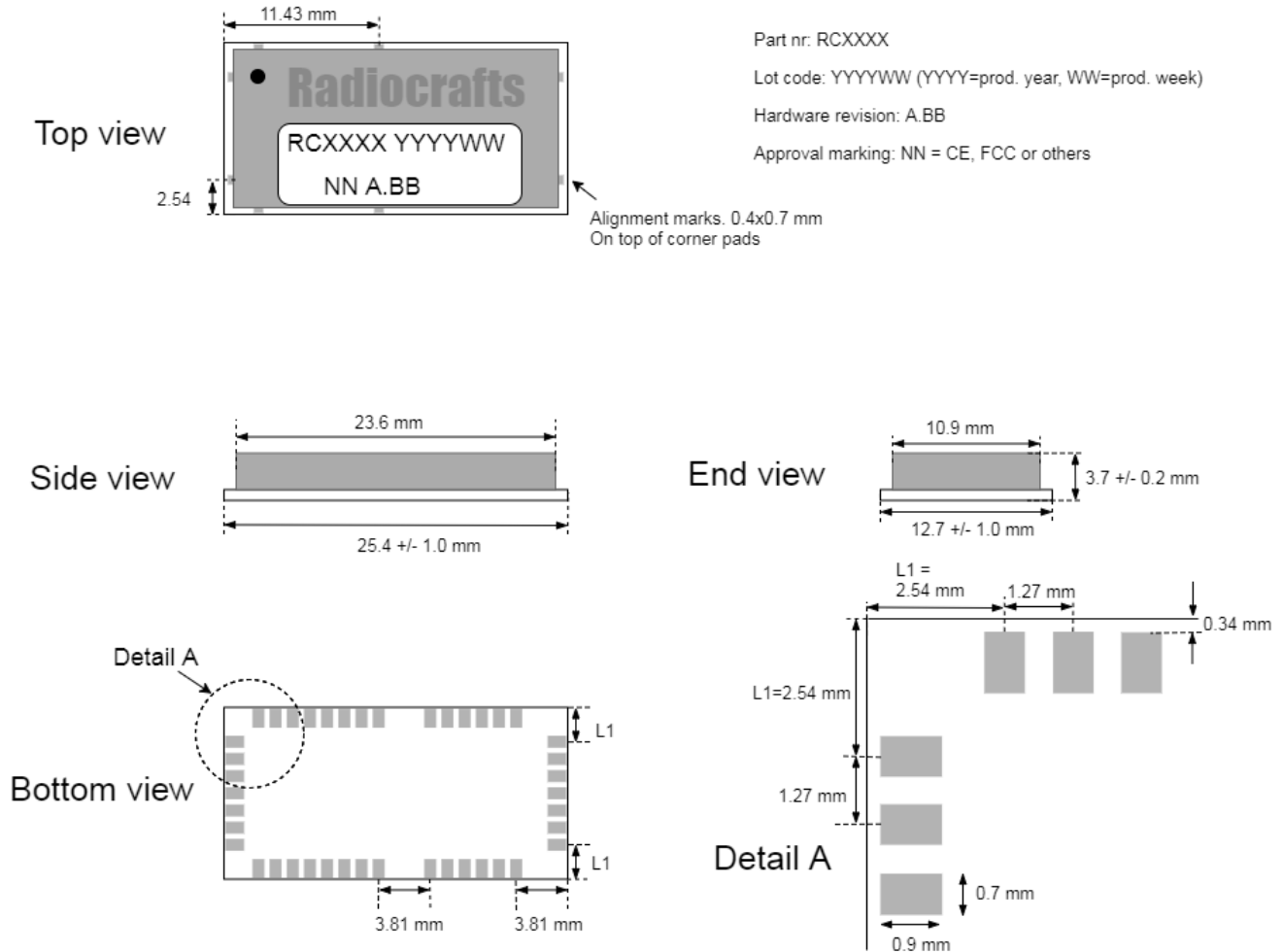
Figure 1. RC1882-MIOTY1 module pinout

Pin Description

| Pin no | Pin name | Description |
|--------|----------|---|
| 1 | GND | System ground |
| 2 | RESV. | Do not connect |
| 3 | RESV. | Do not connect |
| 4 | RESV. | Do not connect |
| 5 | TXD | Configurable I/O pin |
| 6 | RXD | Configurable I/O pin |
| 7 | GND | System ground |
| 8 | I2C SDA | Do not connect |
| 9 | I2C SCL | Do not connect |
| 10 | RESV. | Do not connect |
| 11 | RESV. | Do not connect |
| 12 | TMSC | JTAG interface |
| 13 | TCKC | JTAG interface |
| 14 | TDO | JTAG interface |
| 15 | TDI | JTAG interface |
| 16 | RESV. | Do not connect |
| 17 | RESV. | Do not connect |
| 18 | RESV. | Do not connect |
| 19 | PA_CTR | Internally used signal to control PA. Do not connect. |
| 20 | PA_CTR | Internally used signal to control PA. Do not connect. |
| 21 | PA_CTR | Internally used signal to control PA. Do not connect. |
| 22 | GND | System ground |
| 23 | RF | RF I/O connection to antenna |
| 24 | GND | System ground |
| 25 | RESV. | Not connected |
| 26 | RESET_N | Reset (Active low) |
| 27 | VCC | Supply voltage |
| 28 | GND | System ground |
| 29 | RESV. | Do not connect |
| 30 | RESV. | Do not connect |
| 31 | RESV. | Do not connect |
| 32 | RESV. | Do not connect |
| 33 | RESV. | Do not connect |
| 34 | RESV. | Do not connect |
| 35 | GPIO_2 | Output – HIGH during TX transmission |
| 36 | GPIO_1 | Output – HIGH during RX reception |
| 37 | RESV. | Do not connect |
| 38 | RESV. | Do not connect |
| 39 | RESV. | Do not connect |
| 40 | RESV. | Do not connect |
| 41 | RESV. | Do not connect |
| 42 | RESV. | Do not connect |

Table 1 - Pinout

Mechanical Drawing



Mechanical Dimensions

The module size is 12.7 x 25.4 x 3.7 mm

Carrier Tape and Reel Specification

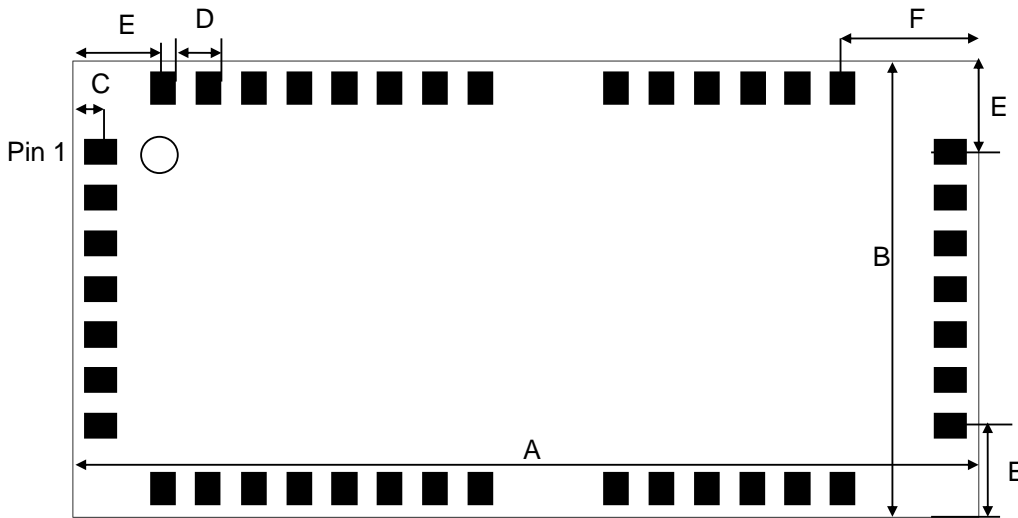
Carrier tape and reel is in accordance with EIA Specification 481.

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

PCB Layout Recommendations

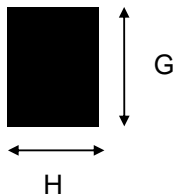
The recommended layout pads for the module are shown in the figure below.

The circle in upper left corner is an orientation mark only and should not be a part of the copper pattern.



| Dimension | Length [mm] (mil) | Comment |
|-----------|-------------------|---|
| A | 25.4 (1000) | Length of module |
| B | 12.7 (500) | Width of module |
| C | 0.79 (31) | Module edge vs centre of pad (Valid for all pads) |
| D | 1.27 (50) | Pad to pad distance |
| E | 2.54 (100) | Modul edge to pad (centre) |
| F | 3.81 (150) | Modul edge to pad (centre) |
| G | 0.9 (35.4) | Length of pad/recommend footprint pad |
| H | 0.7 (27.6) | Width of pad/recommend footprint pad |

Recommended pad design is shown below.



The recommended footprint for solder paste stencils is a one-to-one mapping between the LGA pad on module and the footprint.

For prototype builds, a solder hot plate is recommended. If the prototype is soldered manually by soldering iron, it is recommended to extend the pads of the footprint out from the module to make it accessible for a soldering iron.

RC1882CEF-MIOTY1 DATA SHEET

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.

Routing or vias under the module is not recommended as per IPC-recommendation. If any routing or vias is required under the module, the routing and vias must be covered with solder resist to prevent short circuiting of the test pads. It is recommended that vias are tented.

Reserved pins should be soldered to the pads, but the pads must be left floating electrically (no connection).

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

Soldering Profile Recommendation

JEDEC standard IPC/JEDEC J-STD-020D.1 (page 7 and 8), 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. Nominal stencil thickness of 0.1-0.12 mm recommended.

Absolute Maximum Ratings

| Parameter | Min | Max | Unit |
|-----------------------|------|------------------------|------|
| Supply voltage, VCC | -0.3 | 4.1 | V |
| Voltage on any pin | -0.3 | VCC + 0.3 (max 4.1) | V |
| Input RF level | | 10 | dBm |
| Storage temperature | -40 | 150 | °C |
| Operating temperature | -20 | 70 | °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.

Electrical Specifications

T=25°C, VCC = 3.3V, 868 MHz, 50 ohm if nothing else stated

| Parameter | Min | Typ. | Max | Unit | Condition / Note |
|---------------------------------|---------|--------|---------|-------|---|
| Operating frequency | 866 | | 917 | MHz | |
| Supported modes, EU0 Uplink | 868.130 | | 868.230 | | Centre 868.180 MHz |
| EU0 Downlink | 869.525 | | 869.625 | | Centre 868.575 MHz |
| EU1 Uplink | 868.030 | | 868.230 | | Centres at 868.180 and 868.080 MHz |
| EU1 Downlink | 869.425 | | 869.625 | | Centres at 869.575 and 868.475 MHz |
| EU2 Uplink/Downlink | 866.500 | | 868.000 | | Centres at 867.625 and 866.825 MHz |
| US0 Uplink/Downlink | 915.275 | | 916.725 | | Centres at 916.400 and 915.600 MHz |
| Input/output impedance | | 50 | | Ohm | |
| Data rate | | 2380 | | bit/s | |
| Frequency stability | | | +/- 20 | ppm | Temperature drift -20°-70° + 10 years aging |
| Transmit power | -10 | | 14 | dBm | Programmable from firmware |
| Harmonics | | | | | @ max output power |
| 2 nd harmonic | | -44 | | dBm | |
| 3 rd harmonic | | -43 | | dBm | |
| Spurious emission, TX, 868 MHz | | | | | |
| 30 – 1000 MHz | | | -54 | dBm | EN 300 220 restricted band |
| 30 – 1000 MHz | | | -36 | dBm | EN 300 220 un-restricted band |
| 1-12.75 GHz | | | -30 | dBm | |
| Sensitivity | | -129 | | dBm | |
| Spurious emission, RX | | | | | |
| 1-12.75 GHz | | -59 | | dBm | Complies with EN 300 220 CRF47 Part 15 and ARIB STD-T66 |
| Supply voltage | | | | | |
| Recommended operating voltage | 2.3 | | 3.8 | V | |
| Current consumption, RX | | 6.0 | | mA | VCC = 3.6V |
| Current consumption, TX | | 25 | | mA | Output power 14 dBm, VCC = 3.6V |
| Current idle | | 1.0 | | mA | Waiting for AT command |
| Current consumption, Deep Sleep | | 1.05 | | uA | |
| RAM memory | | 88 | | kB | |
| SoC internal Flash memory | | 352 | | kB | |
| SPI Flash memory | | 1024 | | kB | |
| I2C EEPROM | | 4 | | kB | |
| MCU clock frequency | | 48 | | MHz | |
| MCU low frequency crystal | | 32.768 | | kHz | |
| Antenna VSWR | | <2:1 | 3:1 | | |

Ordering number

| Ordering number | Definition |
|------------------|--|
| RC1882CEF-MIOTY1 | Standard product Includes -C 32 kHz RTC crystal -E 2 kBI2C EEPROM -F 1024 kB SPI flash |

*other variant available for turn-key projects

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. |
| | Not recommended for new designs | Last time buy available | Product close to end of lifetime |
| | Obsolete | Not in Production Optionally accepting order with Minimum Order Quantity | This data sheet contains specifications on a product that has been discontinued by Radiocrafts. The data sheet is printed for reference information only. |

Document Revision History

| Document Revision | Changes |
|-------------------|---|
| 1.00 | First release |
| 1.10 | Removed OTA reference, specified full production. Removed 10 bytes reference. Valid for FW 1.1.0 and later. |
| 2.00 | Added references to new operation profiles e.g. US0 which were added with v2.00 of the FW. |
| 2.01 | Added a note on IPR license fee |

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

All 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 Webpage

For more info go to our webpage: <https://radiocrafts.com/>

There you can find Knowledge base and Document Library that includes Application notes, Whitepapers, Declaration of Conformity, User Manuals, Data Sheet and more.

Contact Information

Web site: www.radiocrafts.com

Email: radiocrafts@radiocrafts.com

Address:

Radiocrafts AS
Sandakerveien 64
NO-0484 OSLO
NORWAY

Tel: +47 4000 5195

Fax: +47 22 71 29 15

E-mail: sales@radiocrafts.com

© 2021-2022, Radiocrafts AS. All rights reserved.