High Performance RF Module for MIOTY 868 MHz

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)
- 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)
- --> Sending and AT%MOD still ok
- Support mode EU0 as transmit
- 10 bytes payload

Part Name Overview

Part name	RF Frequency band	Max output power	VCC
RC1882CEF-MIOTY1	868 MHz	14 dBm	+3.3V

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

Parameter	RC1882CEF-MIOTY1	Unit
Frequency band	862-870	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 command

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

UART setup:
UART-TXD = pin 5
UART-RXD = pin 6
Default baud rate 115200 baud/s
Data bits: 8
Stop bit: 1
Parity: none

More detailed information on the AT command set is available in the MIOTY1 user manual.

Bootloader

The modules are supplied with the same bootloader.

The bootloader is preloaded from Radiocrafts. It allows 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.
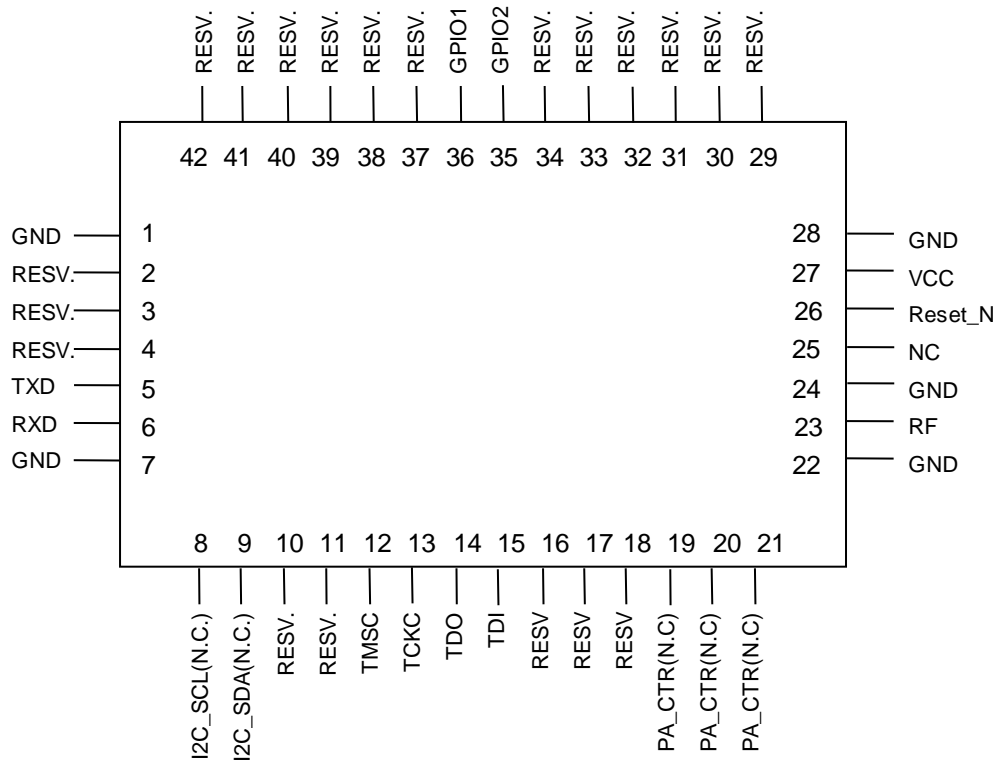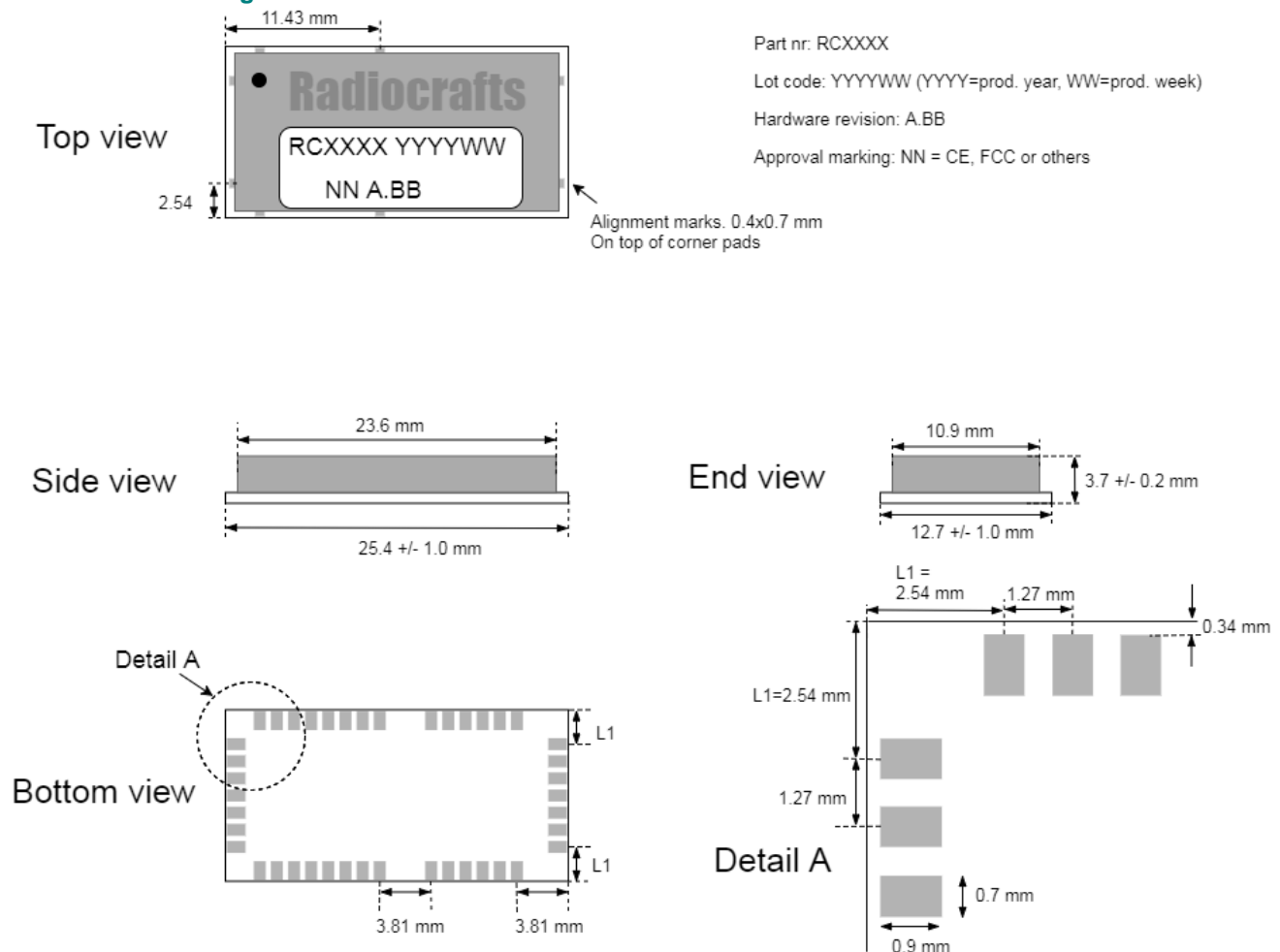
Pin Assignment

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 AT%SEND in progress
36	GPIO_1	Output – HIGH during TX transmission
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

Top view

11.43 mm

2.54

Radiocrafts

RCXXXX YYYYWW
NN A.BB

Part nr: RCXXXX

Lot code: YYYYWW (YYYY=prod. year, WW=prod. week)

Hardware revision: A.BB

Approval marking: NN = CE, FCC or others

Alignment marks. 0.4x0.7 mm
On top of corner pads

Side view

23.6 mm

25.4 +/- 1.0 mm

End view

10.9 mm

3.7 +/- 0.2 mm

12.7 +/- 1.0 mm

Bottom view

Detail A

L1

L1

3.81 mm   3.81 mm

Detail A

$L1 = 2.54$ mm

1.27 mm

0.34 mm

$L1 = 2.54$ mm

1.27 mm

0.7 mm

0.9 mm

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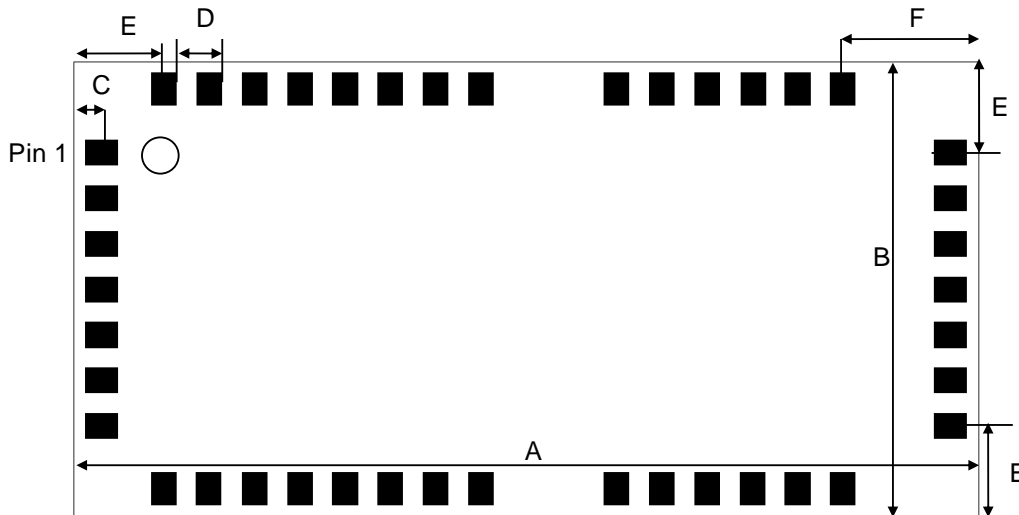
Dimention	Length [mm] (mil)	Comment
A	25.4 (1000)	Length of module
B	12.7 (500)	Width of module
C	0.79 (31)	Module edge vs centre of pad (Valid for all pads)
D	1.27 (50)	Pad to pad distance
E	2.54 (100)	Modul edge to pad (centre)
F	3.81 (150)	Modul edge to pad (centre)
G	0.9 (35.4)	Length of pad/recommend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

Recommended pad design is shown below.
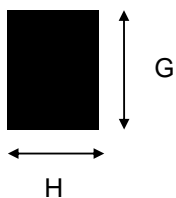
The recommended footprint for solder paste stencil is a one-to-one mapping between the LGA pad on module and the footprint.

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

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	*Caution ! ESD sensitive device. Precaution should be used when handling the device in order to prevent permanent damage.*
Input RF level		10	dBm	
Storage temperature	-40	150	°C	
Operating temperature	-20	70	°C	

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	863		928	MHz	
Supporter modes, EU0	868.130		868.230		Centre 868.180 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
2nd harmonic		-44		dBm	
3rd 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					Complies with EN 300 220 CRF47 Part 15 and ARIB STD-T66
1-12.75 GHz		-59		dBm	
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 for OTA

*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.
X	**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.**
	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

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For more info go to our web page : 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.

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