

# **TR-31B**

## **Transceiver Module**

### **Data Sheet**

- TR-31B-868
- TR-31B-916



Simple way to smarter wireless solutions

## Description:

TR-31B is a family of IQRF transceiver modules operating in the 868 MHz or 916 MHz license free ISM (Industry, Scientific and Medical) frequency band. Its highly integrated ready-to-use design requires no external components. The microcontroller with built-in operating system, excellent development support, integrated LDO regulator and temperature sensor dramatically reduce time of application development. Ultra low power consumption of TR-31B predetermines these modules for use in battery powered applications.



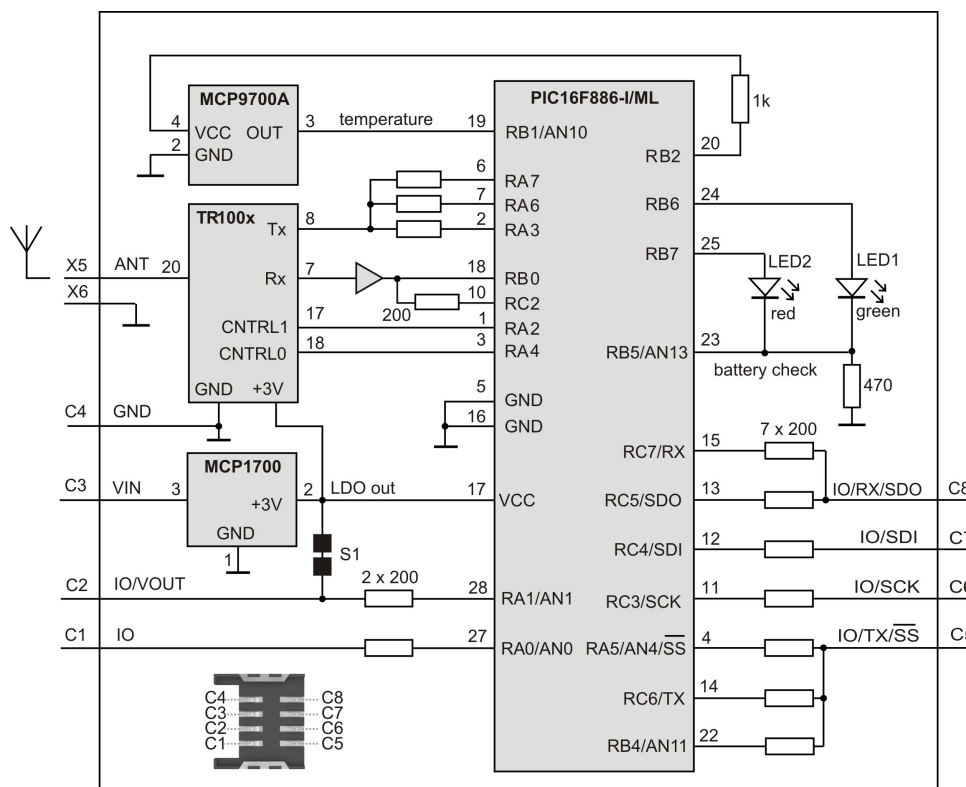
## Applications:

- Telemetry
- Buildings automation
- Wireless control & regulation
- Access control
- Remote data acquisition
- Communications links
- RF connectivity in many other areas

## Key features:

- Complete solution with operating system
- Easy to use - fast learning curve
- Low cost
- Ultra low power consumption
- SPI Interface supported by OS (on background)
- On-board temperature sensor and battery monitoring
- +3 V LDO regulator output
- Dual LED
- 5/6 I/Os, 3 analog inputs (A/D)
- SIM card format
- Coaxial antenna connector (optional)
- On-board antenna (optional)

## Simplified schematics:



**Electrical specifications**
*(typical values unless otherwise stated)*

Supply voltage (VCC):	3.0 V to 5.3 V
Operating temperature:	0 °C to +70 °C -40 °C to +85 °C (Industrial) available on request
<b>Supply current :</b>	
Sleep mode:	2.5 µA @ 3.0V 2.6 µA @ 3.6V
Run mode <sup>1</sup> :	1.0 mA @ 8 MHz 565 µA @ 4 MHz 265 µA @ 1 MHz 170 µA @ 125 kHz 17 µA @ 31 kHz
Rx mode:	4.0 mA @ 8 MHz
Tx mode:	3.0 mA @ 8 MHz, Txpower = 7, transmitting '0' 12.5 mA @ 8 MHz, Txpower = 7, transmitting '1' 3.5 mA @ 8 MHz, Txpower = 1, balanced '0' / '1' 5.0 mA @ 8 MHz, Txpower = 2, balanced '0' / '1' 6.2 mA @ 8 MHz, Txpower = 4, balanced '0' / '1' 7.6 mA @ 8 MHz, Txpower = 6, balanced '0' / '1' 7.6 mA @ 8 MHz, Txpower = 7, balanced '0' / '1'
Additional supply current when LED(s) on: 2 mA	
RF sensitivity:	-101 dBm
RF output power:	up to 1.5 dBm, programmable in 7 levels of Txpower
RF range <sup>3</sup> :	up to 100 m for TR-31BA
Frequency range:	868.35 MHz (TR-31B-868) 916.50 MHz (TR-31B-916)
RF data modulation:	ASK (amplitude-shift-keyed)
RF data transmission bit rate:	20 kb/s
RF data transmission bit rate (true speed) <sup>2</sup> :	up to 13 kb/s
LDO output (VOUT):	+3 V, 100 mA max.
A/D converter:	10 b, 3 inputs (multiplexed S&H, successive approximation)
Input A/D impedance:	10 kΩ max.
Temperature sensor accuracy:	±2 °C max. (not calibrated) ±0.1 °C min. (calibrated)
Size (L x W x H):	25.0 mm x 14.9 mm x 3.0 mm 41.8 mm x 14.9 mm x 3.0 mm (TR-31BA)

**Note 1:** TR1001 in standby mode, BOR disabled, WDT disabled

**Note 2:** True speed of RF data transmission strongly depends on transmitted data structure.

**Note 3:** RF range strongly depends on module orientation and surroundings.

*The EU users have to ensure observing the CEPT ERC/REC 70-03 Recommendation and subsequent amendments relating to the use of short range devices by software.*

**Absolute maximum ratings**

Stresses above those values may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect device reliability.

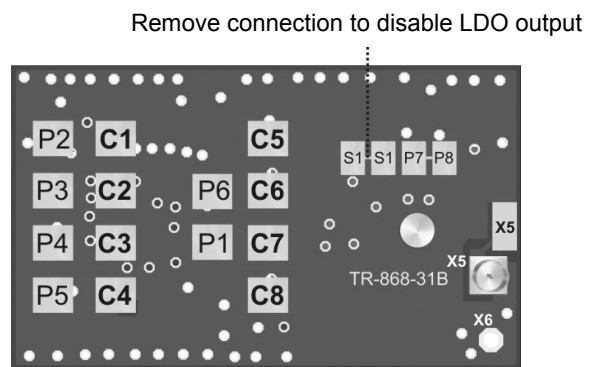
Supply voltage (VCC):	5.5 V
Storage temperature:	-50 °C to +100 °C
Ambient temperature under bias:	-40 °C to +85 °C

For more information refer to datasheets of ICs used:

IC	type	manufacturer
<b>MCU</b>	PIC16F886-I/ML	Microchip
<b>RF</b>	TR1001 (868 MHz) / TR1000 (916 MHz)	RF Monolithics (RFM)
<b>LDO voltage regulator</b>	MCP1700	Microchip
<b>Temperature sensor</b>	MCP9700A	Microchip

Pin	Name	Description
C1	<b>IO/AN</b>	
	RA0	General I/O pin
	AN0	Analog A/D input
C2	<b>IO/AN/VOUT</b>	
	RA1	General I/O pin (S1 disconnected)
	AN1	Analog A/D input (S1 disconnected)
	VOUT	On-board +3 V LDO output (S1 connected – default)
C3	<b>VIN</b>	Power supply voltage
C4	<b>GND</b>	Ground
C5	<b>IO/AN/TX/-SS</b>	
	RA5	General I/O pin
	AN4	Analog A/D input
	-SS	SPI Slave select
	RC6	General I/O pin
	TX	UART TX
	RB4	General I/O pin, Interrupt on change
	AN11	Analog A/D input
C6	<b>IO/SCK/SCL</b>	
	RC3	General I/O pin
	SCK	SPI clock
	SCL	I2C clock
C7	<b>IO/SDI/SDA</b>	
	RC4	General I/O pin
	SDI	SPI data in
	SDA	I2C data
C8	<b>IO/SDO/RX</b>	
	RC5	General I/O pin
	SDO	SPI data out
	RC7	General I/O pin
	RX	UART RX
X5	<b>ANT</b>	Antenna input
X6	<b>GND</b>	Ground (for dipole antenna)
P1–P8		For factory programming only

### Bottom view:

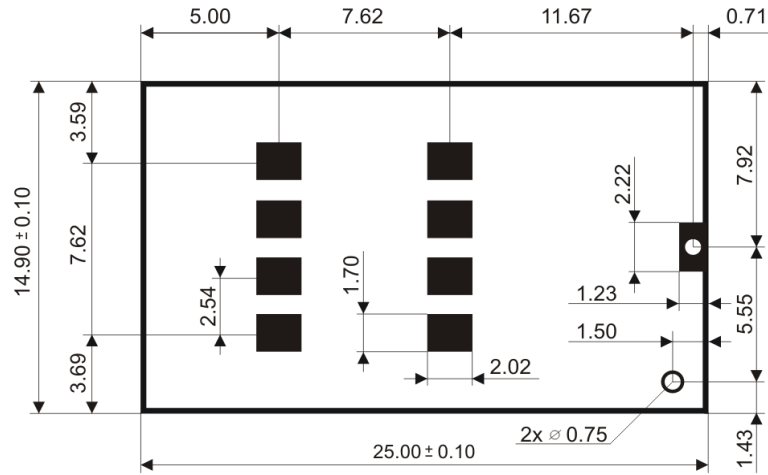


### Application:

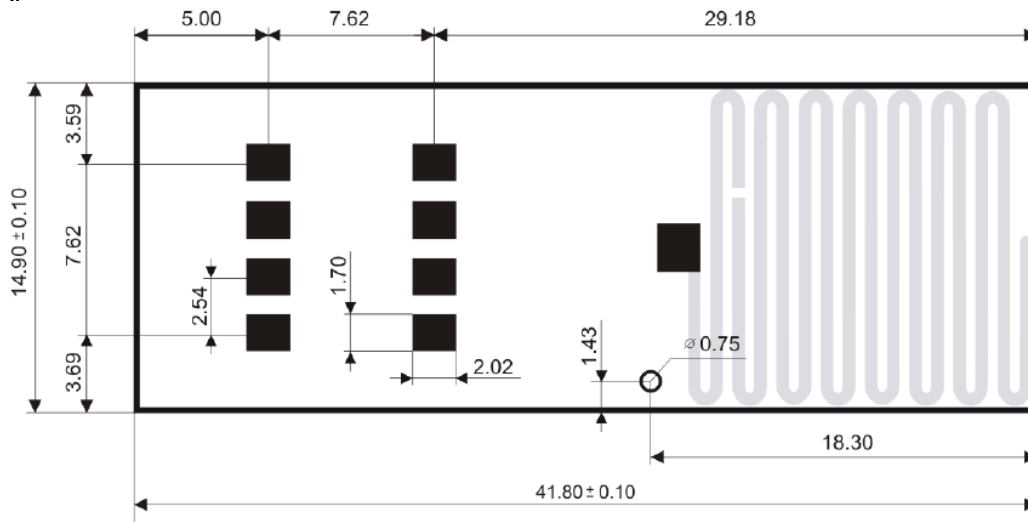
See IQRF OS User's manual, Application examples, [www.iqrf.org](http://www.iqrf.org) and [www.iq-esupport.com](http://www.iq-esupport.com).

## Dimensions:

TR-31B, TR-31BK, TR-31BC:



TR-31BA:

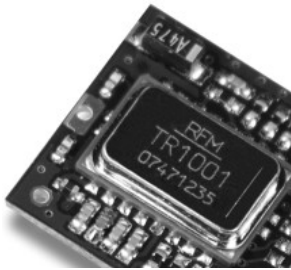


Units: mm

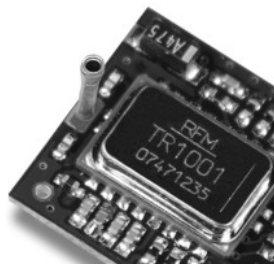
Recommended SIM connector: KON-SIM-01

## Ordering codes:

Type	frequency [MHz]	locality	antenna connector
TR-31B-868	868	EU	–
TR-31BK-868	868	EU	for AN-868-03 (¼ whip)
TR-31BC-868	868	EU	KON-U.FL-R-SMT (mini coax) for AN-05-C or CAB-U.FL
TR-31BA-868	868	EU	built-in PCB antenna
TR-31B-916	916	USA	–
TR-31BK-916	916	USA	for AN-916-03 (¼ whip)
TR-31BC-916	916	USA	KON-U.FL-R-SMT (mini coax) for AN-05-C or CAB-U.FL
TR-31BA-916	916	USA	built-in PCB antenna



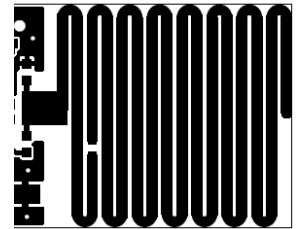
TR-31B



TR-31BK



TR-31BC



TR-31BA

## Document history

- 100421 Slightly revised and updated
- 081118 First release

---

# Sales and Service

---

## Corporate office

MICRORISC s.r.o., Delnicka 222, 506 01 Jicin, Czech Republic, EU  
Tel: +420 493 538 125, Fax: +420 493 538 126, [www.microrisc.com](http://www.microrisc.com)

## Partners and distribution

Please visit [www.iqrf.org/partners](http://www.iqrf.org/partners)

---

## Quality management

*ISO 9001 : 2000 certified*

*Complies with ETSI directives EN 30279 V.1.2.1:99, ETS 30683:97, ETSI EN 301489-1:00,  
ETSI EN 300220-1:00, ETSI EN 300390-2V.1.1.1:00*

*Complies with FCC directives FCC CFR, Title 47, Part 15, Section 15.209, FCC CFR, Title 47, Part 15, Section 15.249*

*Complies with Directive 2002/95/EC (RoHS)*



## Trademarks

*The IQRF name and logo are registered trademarks of MICRORISC s.r.o.  
PIC, SPI, Microchip, RFM and all other trademarks mentioned herein are property of their respective owners.*

## Legal

*All information contained in this publication is intended through suggestion only and may be superseded by updates without prior notice. No representation or warranty is given and no liability is assumed by MICRORISC s.r.o. with respect to the accuracy or use of such information.*

*Without written permission it is not allowed to copy or reproduce this information, even partially.*

*No licenses are conveyed, implicitly or otherwise, under any intellectual property rights.*

*The IQRF products utilize several patents (CZ, EU, US)*

---

**On-line support: <http://iq-esupport.com>**

---



**Simple way to smarter wireless solutions**