

# **TR-xxx-31B**

## **Transceiver Module**

### **Data Sheet**

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



Simple way to smarter wireless solutions

## Description:

TR-xxx-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-xxx-31B predetermines these modules for use in battery powered applications.



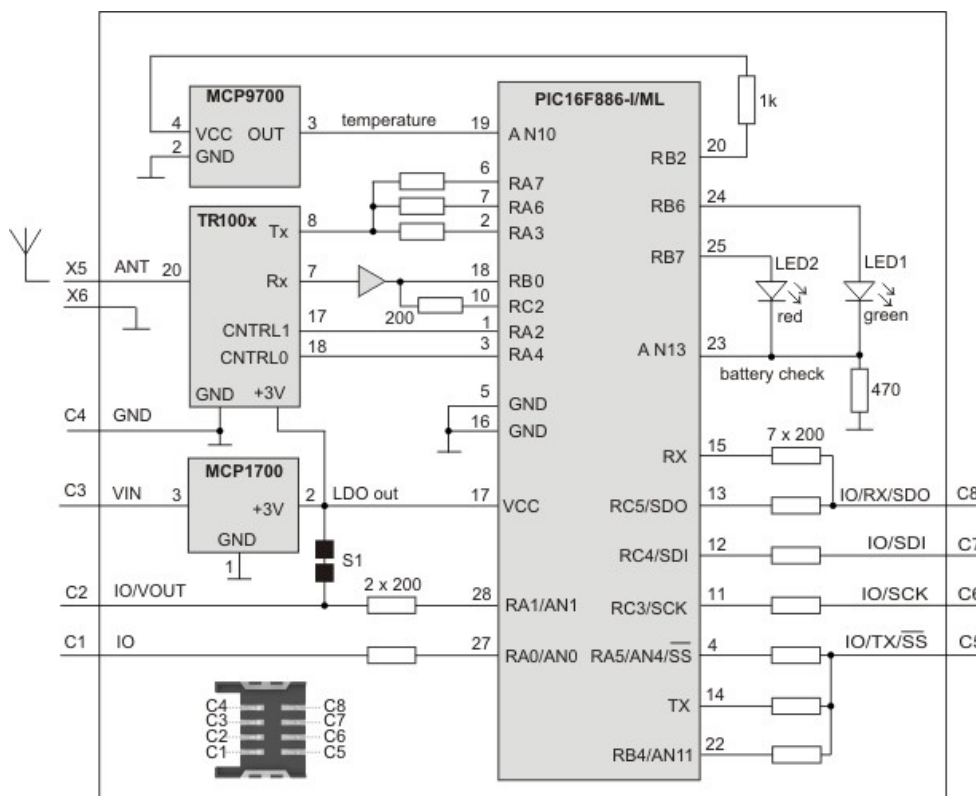
## Applications:

- 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

**Supply current :**

Sleep mode:	2.5 $\mu$ A @ 3.0V 2.6 $\mu$ A @ 3.6V
Run mode <sup>1</sup> :	1.0 mA @ 8 MHz 565 $\mu$ A @ 4 MHz 265 $\mu$ A @ 1 MHz 170 $\mu$ A @ 125 kHz 17 $\mu$ A @ 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-xxx-31BA ( <i>preliminary information</i> )
Frequency range:	868.35 MHz (TR-868-31A) 916.50 MHz (TR-916-31A)
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 k $\Omega$ max.
Temperature sensor accuracy:	$\pm$ 4 °C max. (not calibrated) $\pm$ 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-XXX-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.

**Absolute maximum ratings**

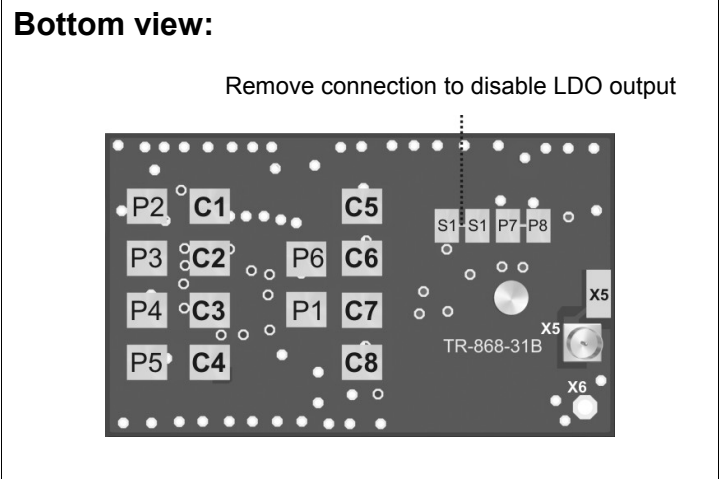
Stresses above those values may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect device reliability.

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>	MCP9700	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, AN11	Analog A/D input
	TX	UART TX
	-SS	SPI Slave select input (SPI enabled)
	RB4	General I/O pin, Interrupt on change
C6	<b>IO/SCK</b>	
	RC3	General I/O pin
	SCK	SPI clock input (SPI enabled)
C7	<b>IO/SDI</b>	
	RC4	General I/O pin
	SDI	SPI data in (SPI enabled)
C8	<b>IO/RX/SDO</b>	
	RC5	General I/O pin
	RX	UART RX
	SDO	SPI data out (SPI enabled)
X5	<b>ANT</b>	Antenna input
X6	<b>GND</b>	Ground (for dipole antenna)
P1–P8		For factory programming only

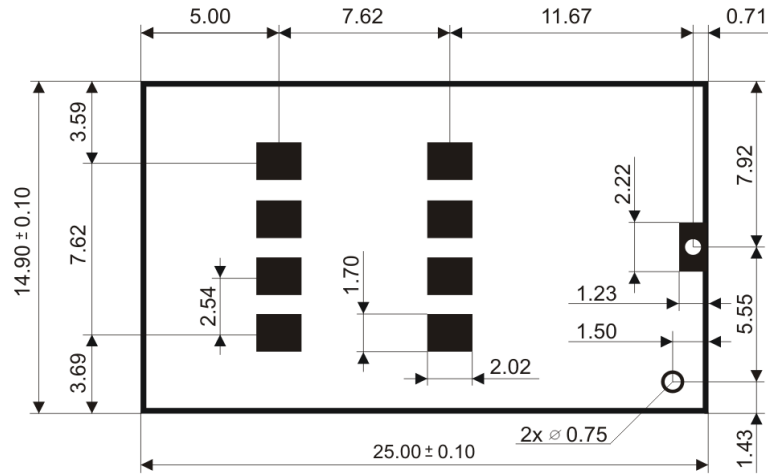


## Application:

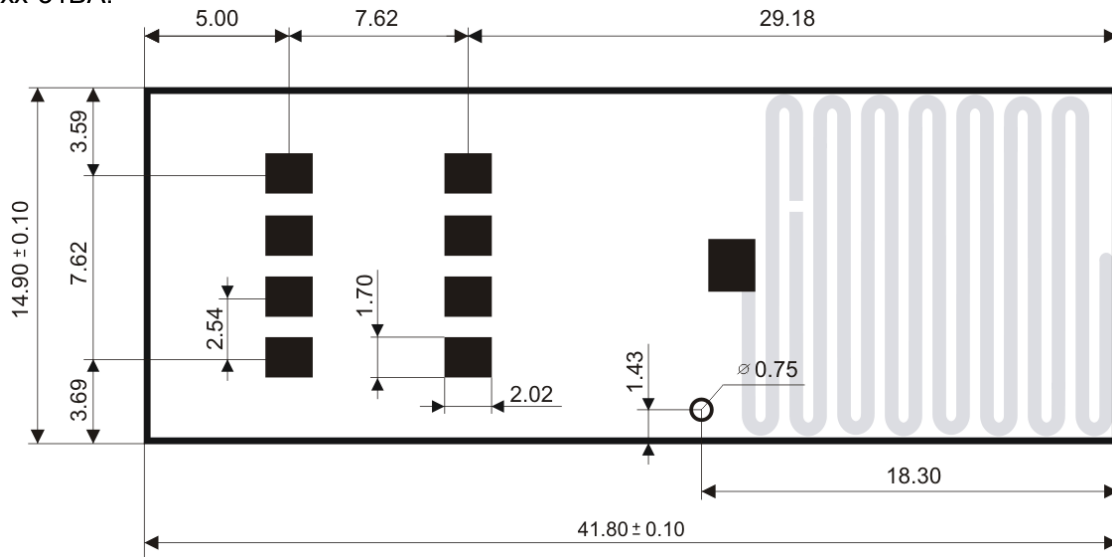
See IQRF OS User's manual, Application examples, [www.iqrf.org](http://www.iqrf.org) and [www.iq-esupport.com](http://www.iq-esupport.com).

## Dimensions:

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



TR-xxx-31BA:

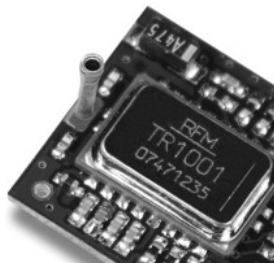


Units: mm

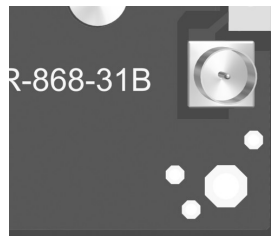
Recommended SIM connector: KON-SIM-01

## Ordering codes:

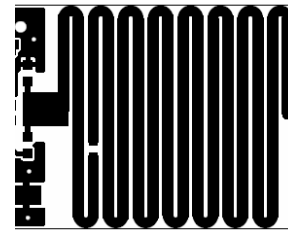
Type	frequency [MHz]	locality	antenna connector
TR-868-31B	868	EU	–
TR-868-31BK	868	EU	for AN-868-03 (¼ whip)
TR-868-31BC	868	EU	for AN-868-20 (coax)
TR-868-31BA	868	EU	built-in PCB antenna
TR-916-31B	916	USA	–
TR-916-31BK	916	USA	for AN-868-03 (¼ whip)
TR-916-31BC	916	USA	for AN-868-20 (coax)
TR-916-31BC	916	USA	built-in PCB antenna



TR-xxx-31BK



TR-xxx-31BC



TR-xxx-31BA

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# Sales and Service

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