

# **TR-52B**

## **Transceiver Module**

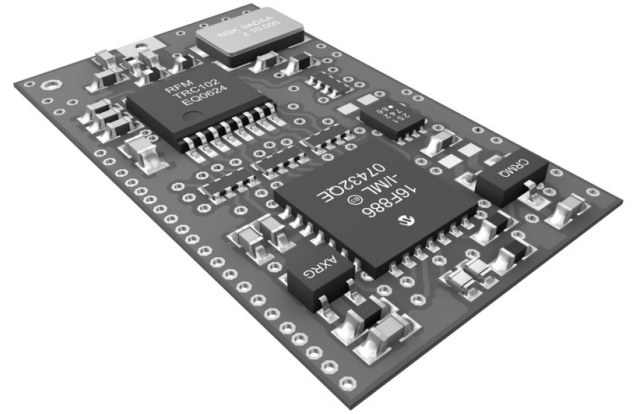
### **Data Sheet**



Simple way to smarter wireless solutions

## Description

TR-52B is a family of IQRF transceiver modules operating in the 868 MHz and 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, temperature sensor and serial EEPROM dramatically reduce time of application development. Ultra low power consumption predetermines these modules for use in battery powered applications.



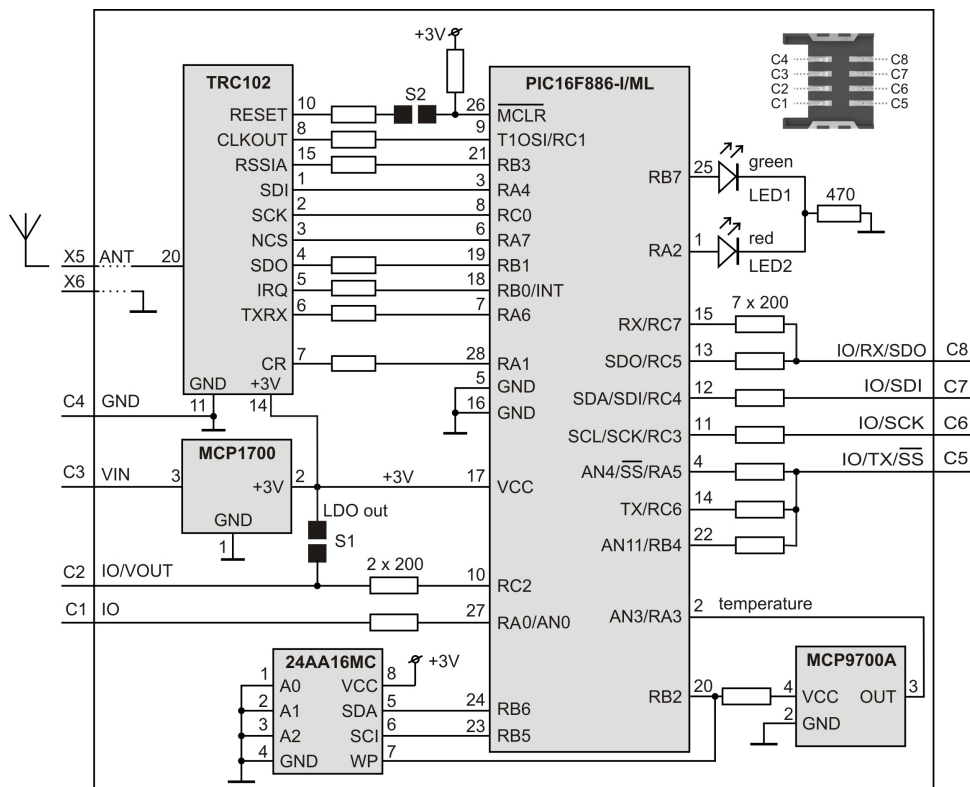
## Applications

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

## Key features

- Complete solution with operating system, easy to use
- Extended RF power, FSK modulation, selectable RF bit rate
- Selectable band 868 / 916 MHz, multiple channel
- MCU with extended Flash memory, additional serial EEPROM
- Ultra low power consumption, power management modes
- SPI interface supported by OS on background
- On-board temperature sensor and battery monitoring
- +3 V LDO regulator output, 2 LEDs
- Up to 6 I/Os, up to 2 analog inputs (A/D)
- SIM card format, low cost
- Coaxial antenna connector (optional)
- On-board antenna (optional)

## Simplified schematics



**Electrical specifications**
*(typical values unless otherwise stated, for brief guidance only)*

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 µA
Additional watchdog supply current	2 µA typ., 4 µA max. (watchdog enabled)
Run mode <sup>1</sup>	1 mA @ 8 MHz 170 µA @ 125 kHz 17 µA @ 31 kHz
Additional supply current	0.6 mA (TRC102 on) 2 mA (one or two LEDs on)
Rx mode	13 mA (STD mode) 400 µA (LP mode <sup>4</sup> ) 35 µA max. (XLP mode <sup>4</sup> )
Tx mode	14 mA – 24 mA (according to RF output power)
RF sensitivity <sup>2</sup>	-110 dBm @ 868 MHz, 1.2 kb/s - 99 dBm @ 868 MHz, 19.2 kb/s -109 dBm @ 916 MHz, 1.2 kb/s -102 dBm @ 916 MHz, 19.2 kb/s
RF output power	up to 5 dBm, programmable in 8 steps (7-0), -3dBm/step
RF range (TR-52BA) <sup>3</sup>	up to 700 m @ 1.2 kb/s up to 500 m @ 19.2 kb/s
Nominal frequency	868.35 MHz or 916.50 MHz (software selectable)
Channels	In accordance with the CEPT ERC/REC 70-03 General License See IQRF OS User's guide, Appendix 2, Channel maps
RF data modulation	FSK (frequency-shift-keyed)
RF data transmission bit rate	1.2 kb/s – preliminary 19.2 kb/s 57.6 kb/s – preliminary 86.2 kb/s – preliminary
LDO output (VOUT)	+3 V ± 60 mV, 100 mA max.
A/D converter	10 b, 2 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 31.8 mm x 14.9 mm x 3.0 mm (TR-52BA)

**Note 1:** TRC 102 in standby mode.

**Note 2:** RF sensitivity depends on frequency band and bit rate.

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

**Note 4:** Depends on interferences.

*Users have to ensure observing local provisions and restrictions relating to the use of short range devices by software, e.g. the CEPT ERC/REC 70-03 Recommendation and subsequent amendments in EU.*

**Absolute maximum ratings**

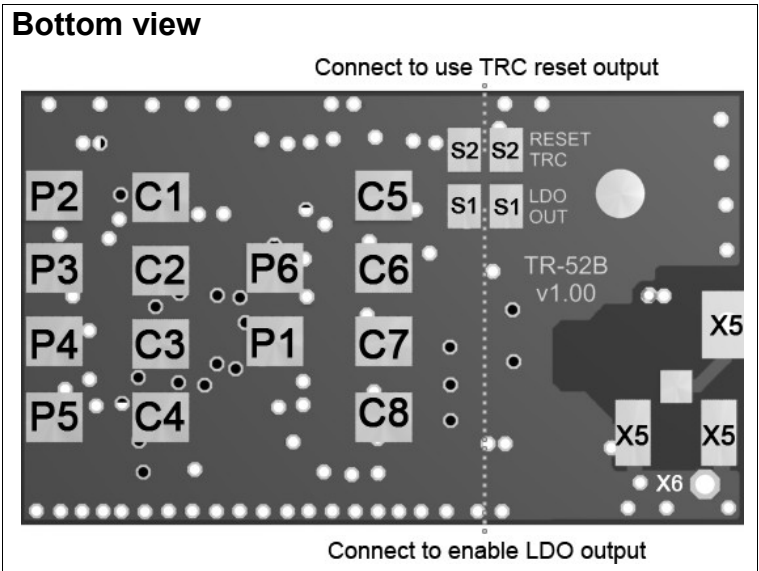
Stresses above those values may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect device reliability.

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

Table 1: For more information refer to datasheets of ICs used:

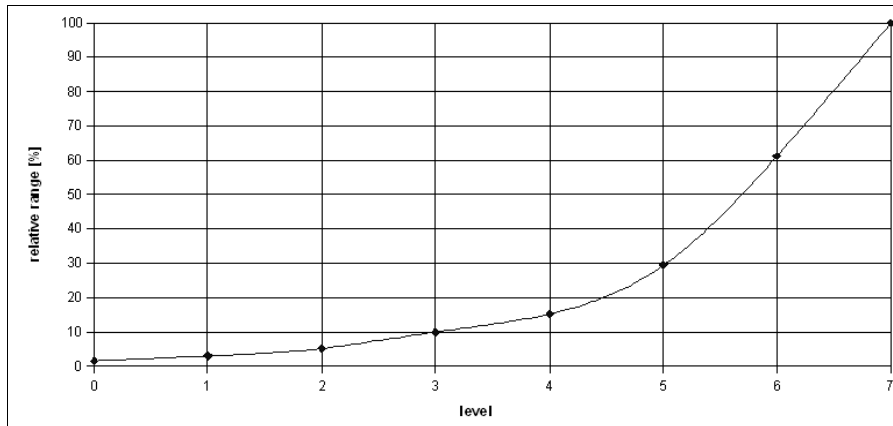
IC	type	manufacturer
MCU	PIC16F886-I/ML	Microchip
RF IC	TRC102	RF Monolithics (RFM)
LDO voltage regulator	MCP1700	Microchip
Temperature sensor	MCP9700A	Microchip

Pin	Name	Description
C1	<b>IO/AN</b>	
	RA0	General I/O pin
	AN0	Analog A/D input
C2	<b>IO/AN/VOUT</b>	
	RC2	General I/O pin (S1 disconnected)
	VOUT	On-board +3 V LDO output (S1 connected)
C3	<b>VIN</b>	Power supply voltage
C4	<b>GND</b>	Ground
C5	<b>IO/AN/TX/-SS</b>	
	RA5	General I/O pin,
	-SS	SPI Slave select
	AN4	Analog A/D input
	RC6	General I/O pin
	TX	UART Tx
C6	<b>IO/SCK/SCL</b>	
	RB4	General I/O pin, wake-up on change
	AN4, AN11	Analog A/D input
C6	<b>IO/SCK/SCL</b>	
	RC3	General I/O pin
	SCK	SPI clock input
	SCL	I <sup>2</sup> C clock
C7	<b>IO/SDI/SDA</b>	
	RC4	General I/O pin
	SDI	SPI data
	SDA	I <sup>2</sup> C data
C8	<b>IO/RX/SDO<sup>5</sup></b>	
	RC5, RC7	General I/O pin
	RX	UART Rx
	SDO	SPI data out
X5	<b>ANT</b>	Antenna input
X6	<b>GND</b>	Ground (for dipole antenna)
P1–P6		For factory programming only
S1		LDO output enable. Connect to enable (default disabled).
S2		TRC102 reset output enable. Connect to reset the MCU from the TRC102 (default disabled).

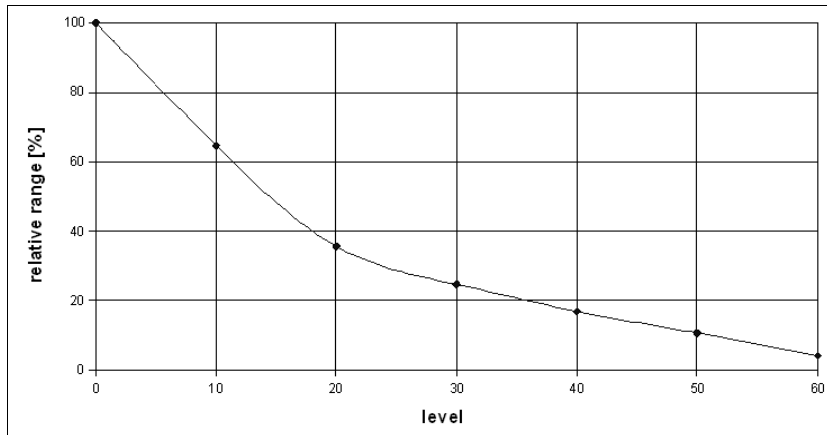


**Note 5:** This pin is used as output during initial ~250 ms boot-up to recognize programming mode.

**Table 2:** Relative RF range vs. level for the `setTXpower(level)` function. Refer to IQRF OS Reference guide.



**Table 3:** Relative RF range vs. level for the `checkRF(level)` detection. Refer to IQRF OS Reference guide.

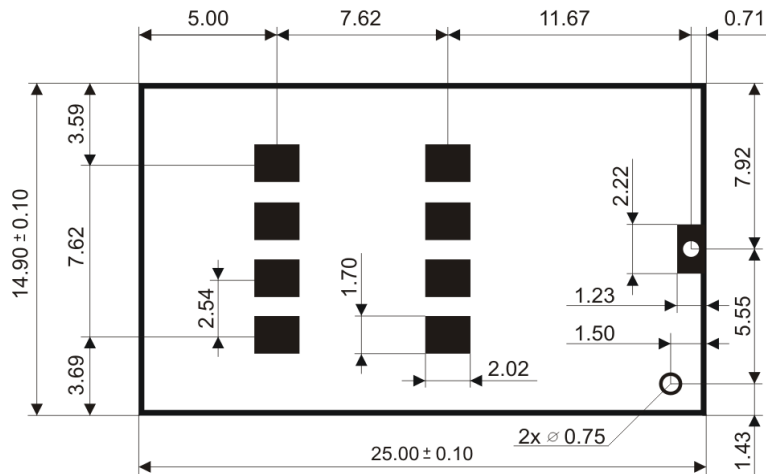


## Application

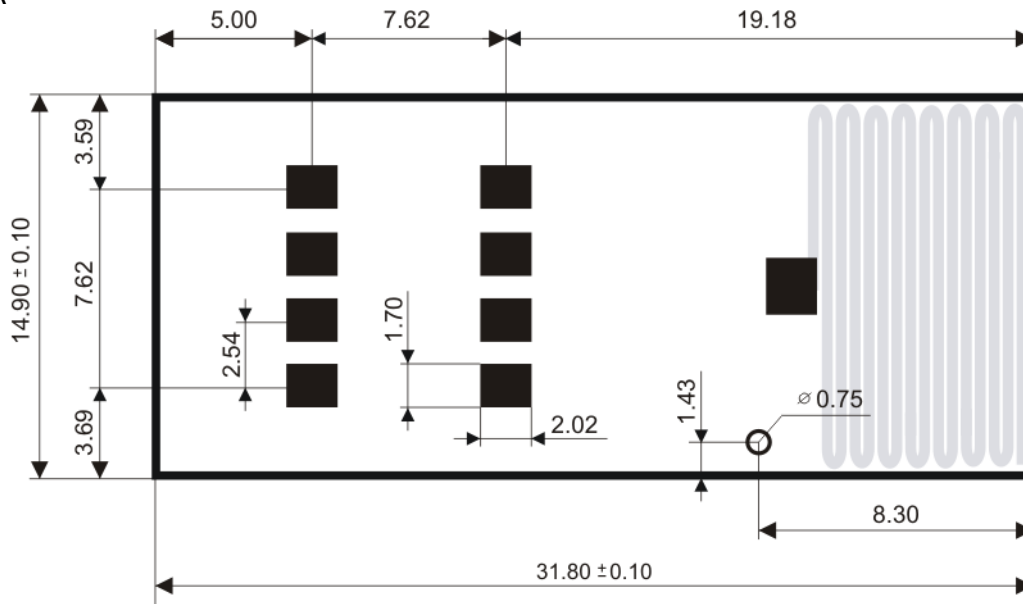
See IQRF OS User's guide, IQRF OS Reference guide, Application examples and [www.iqrf.org](http://www.iqrf.org).

## Dimensions

TR-52B, TR-52BK, TR-52BC



TR-52BA

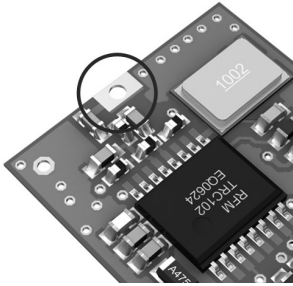


Units: mm

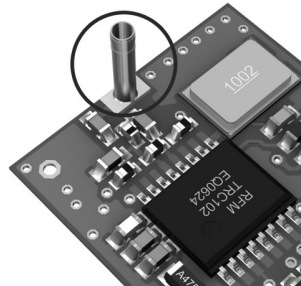
Recommended SIM connector: KON-SIM-01

## Ordering codes

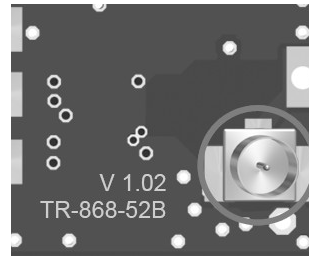
Type	frequency [MHz]	antenna connector
<b>TR-52B</b>	868 / 916	soldering hole
<b>TR-52BK</b>	868 / 916	KON-AN-03 for AN-03 (¼ whip)
<b>TR-52BC</b>	868 / 916	KON-U.FL-R-SMT (mini coax) for AN-05-C or CAB-U.FL
<b>TR-52BA</b>	868 / 916	built-in PCB antenna



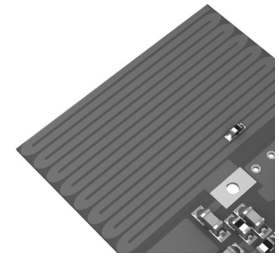
TR-52B



TR-52BK



TR-52BC



TR-52BA

## Document history

- 110124 Power consumption updated for IQRF OS v3.00.
- 100927 Error in dimensions on page 3 corrected.
- 100506 Info about the temperature sensor, Note 5 and local restrictions added/corrected.
- 100421 Slightly revised and updated.
- 100209 First release.
- 090612 Preliminary.

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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)*



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