

# **TR-55D**

## **Transceiver Module**

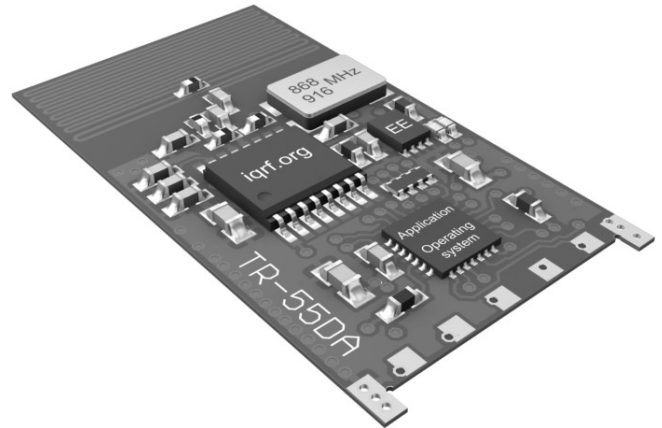
# **Data Sheet**

***Preliminary***



## Description

TR-55D 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. Extra low power consumption fits for battery powered applications. Vertical mounting and small dimensions allow space saving.



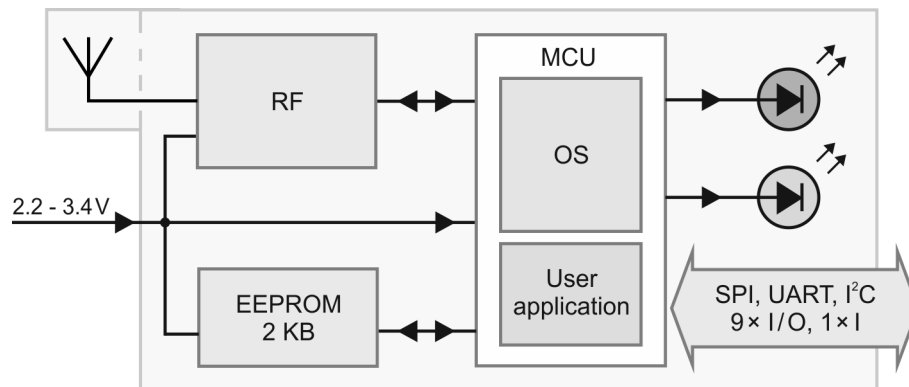
## Applications

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

## Key features

- Complete solution with operating system, easy to use
- FSK modulation
- Selectable band 868 / 916 MHz, multiple channel
- Selectable RF bit rate
- MCU with extended resources
- Extra low power consumption, power management modes
- SPI interface supported by OS on background
- 12 pins, 9 I/Os, 1 input, 3 A/D inputs
- Vertical mounting, SIM card compatible
- Serial EEPROM
- Small dimensions

## Block schematics



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

Supply voltage ( $V_{CC}$ ) <sup>1</sup>	2.2 V min., 3.4 V max., <b>3.0 V typ.</b> , stabilized.
Operating temperature	0 °C to +70 °C -40 °C to +85 °C (Industrial) available on request
Supply current	
Sleep mode	380 nA (if all peripherals including MRF49XA disabled <sup>4</sup> )
Additional supply current	800 nA (if watchdog enabled) 7.5 µA (if brown-out detection enabled)
Run mode	1 mA (MRF49XA disabled)
Additional supply current	0.6 mA (MRF49XA on)
Rx mode	13 mA (STD mode) 400 µA (LP mode <sup>5</sup> ) 35 µA (XLP mode <sup>5</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-52DA) <sup>3</sup>	Up to 850 m @ 1.2 kb/s Up to 650 m @ 19.2 kb/s
Nominal frequency	868.35 MHz or 916.50 MHz (software selectable)
Channels	See IQRF OS User's guide, Appendix 2, Channel maps
RF data modulation	FSK (frequency-shift keying)
RF data transmission bit rate	1.2 kb/s, 19.2 kb/s, 57.6 kb/s, 86.2 kb/s
Input voltage on I/O pins	0 V to $V_{CC}$
A/D converter	10 b, 4 inputs (multiplexed S&H, successive approximation)
Input A/D impedance	10 kΩ max.
Dimensions	27.4 mm x 14.9 mm x 3.0 mm (TR-55DA)

**Note 1:** RF power and other parameters depend on supply voltage. Refer to datasheets of MCU and RF IC used. Test your application with respect to required supply voltage range.

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

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

**Note 4:** Additional current is consumed when a peripheral is enabled.

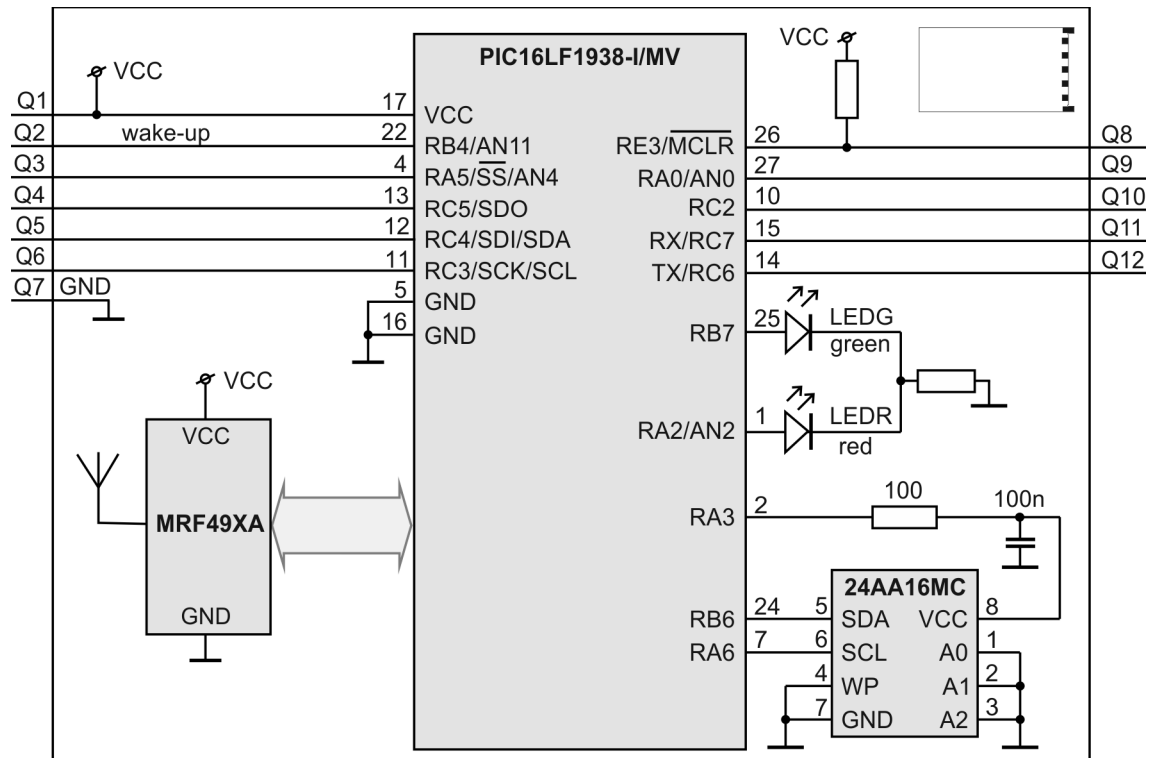
**Note 5:** Depends on interferences.

*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 ( $V_{CC}$ )	4 V
Voltage on I/O pins	-0.3 V to ( $V_{CC} + 0.3$ V)
Storage temperature	-50 °C to +100 °C
Ambient temperature under bias	-40 °C to +85 °C

**Simplified schematics**

**Basic parts**

Part	Type	Manufacturer	Note
<b>MCU</b>	PIC16LF1938-I/ML	Microchip	
<b>RF IC</b>	MRF49XA	Microchip	
<b>EEPROM</b>	24AA16/MC	Microchip	2 kB

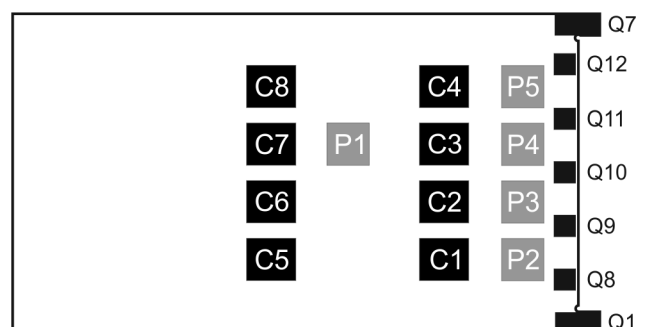
For more information refer to respective datasheets.

Pin	Name	Description
Q1, C3	<b>VCC</b>	Power supply voltage
Q2	<b>IO/AN</b> RB4 AN11	General I/O pin Analog A/D input
Q3, C5	<b>IO/AN/-SS</b> RA5 AN4 -SS	General I/O pin, Analog A/D input SPI Slave select
Q4 <sup>6</sup> , C8	<b>IO/SDO</b> RC5 SDO	General I/O pin SPI data out
Q5, C7	<b>IO/SDI/SDA</b> RC4 SDI SDA	General I/O pin SPI data I <sup>2</sup> C data
Q6, C6	<b>IO/SCK/SCL</b> RC3 SCK SCL	General I/O pin SPI clock input I <sup>2</sup> C clock
Q7, C4	<b>GND</b>	Ground
Q8	<b>I</b> RE3	General input only pin
Q9, C1	<b>IO/AN</b> RA0 AN0	General I/O pin Analog A/D input
Q10, C2	<b>IO</b> RC2	General I/O pin
Q11	<b>IO/RX</b> RC7 RX	General I/O pin UART RX
Q12	<b>IO/TX</b> RC6 TX	General I/O pin UART TX
P1-P2	For manufacturer only	

Top view



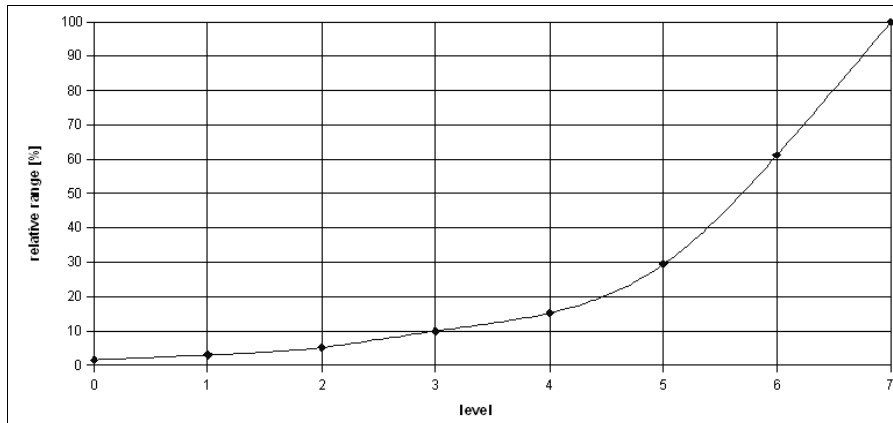
Bottom view



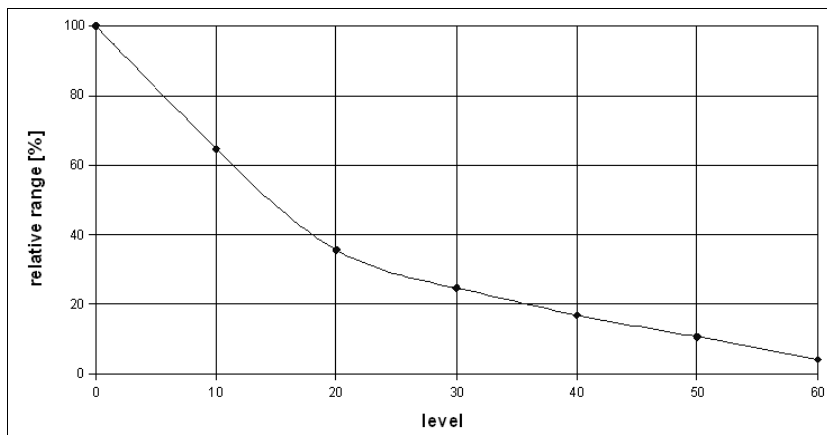
**Note 6:** This pin is used as output during initial ~250 ms boot-up to recognize programming mode.

There are no on-board protection series resistors on I/O pins. It is recommended to use series resistors 200 Ω on each pin.

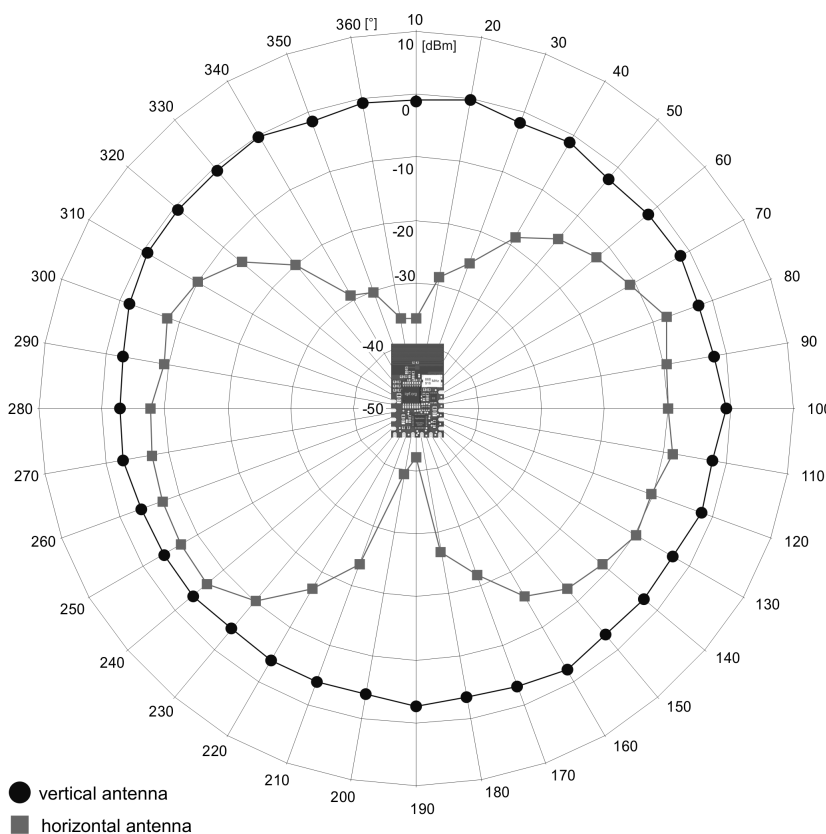
**Figure 1:** Relative RF range vs. level for the `setTXpower(level)` function. Refer to IQRF OS Reference guide.



**Figure 2:** Relative RF range vs. level for the `checkRF(level)` detection. Refer to IQRF OS Reference guide.



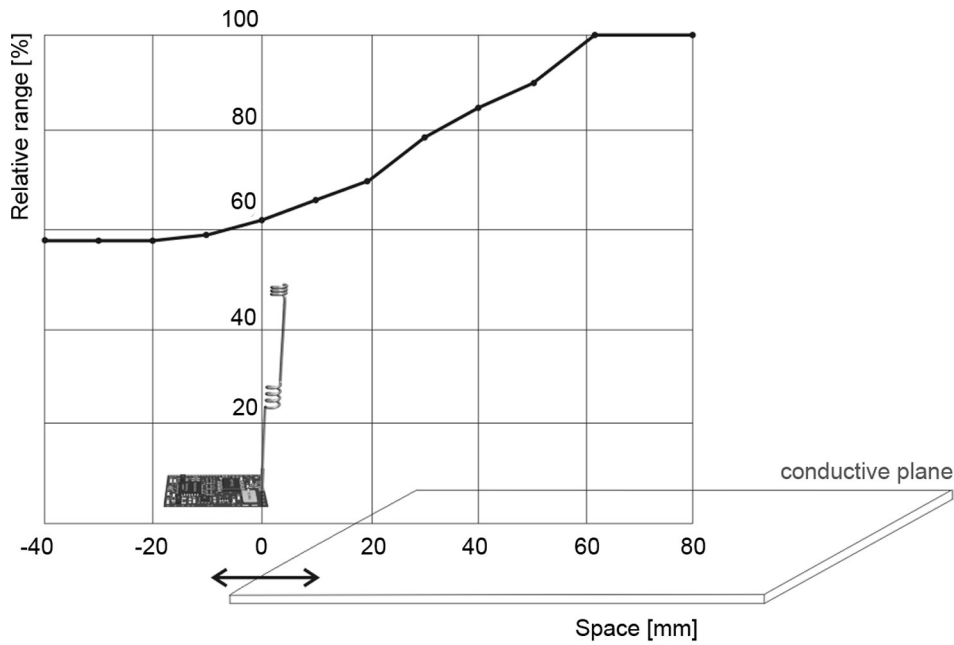
**Figure 3:** Relative RF range vs. antenna orientation (radiation patterns)



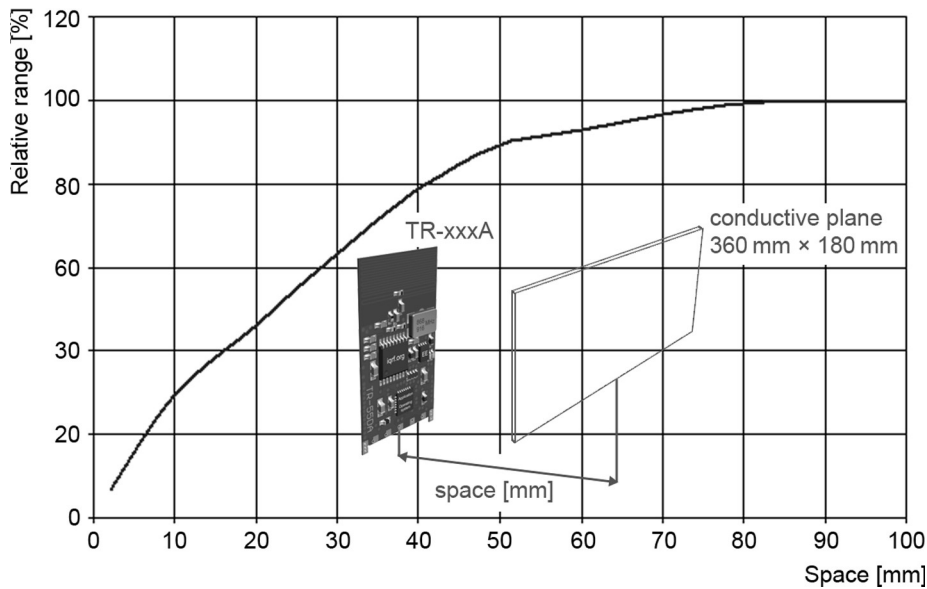
## Relative decrease of RF input signal vs. antenna edge spacing to conductive areas

Conductive areas close to the antenna must be avoided.

**Figure 4:** Perpendicular arrangement

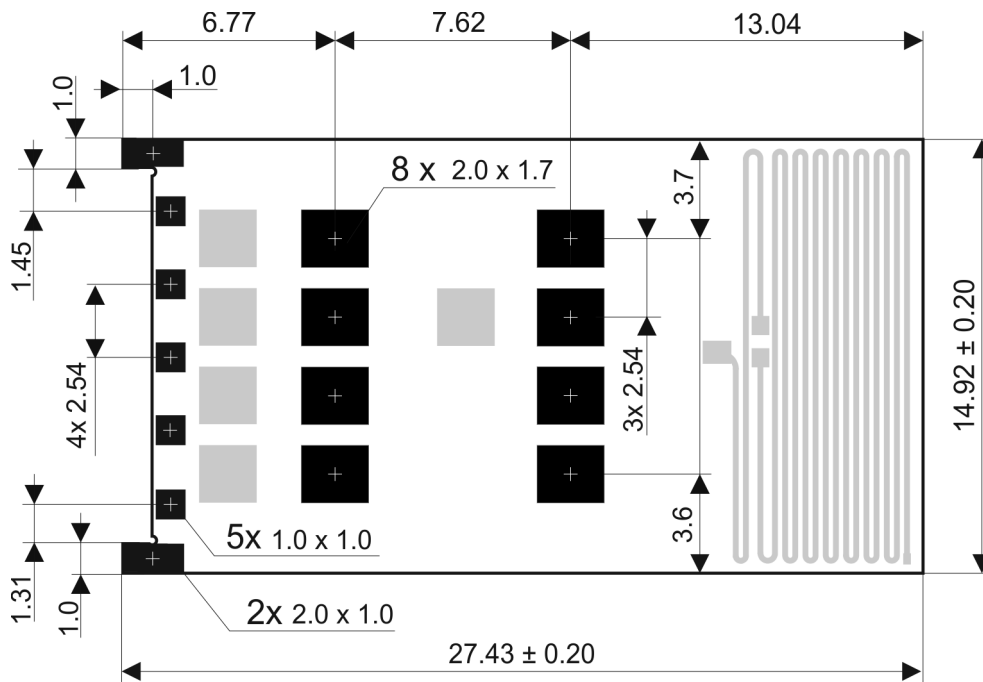


**Figure 5:** Parallel arrangement



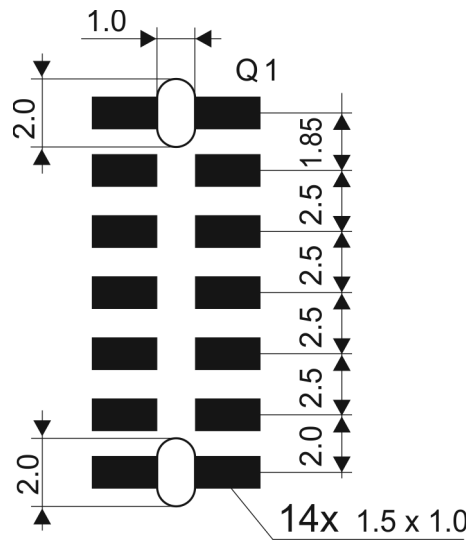
## Dimensions

TR-55DA



Top view, units: mm

## Recommended PCB layout



Top view, units: mm



---

**Application**

---

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

---

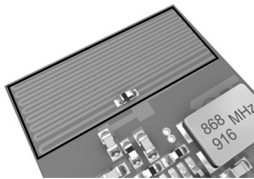
**Product information**

---

**Ordering codes**

T R - 5 5 D A \_\_\_\_\_ antenna options: **A** - PCB antenna

Type	Antenna option	Serial EEPROM
TR-55DA	Internal PCB antenna	2 kB



TR-55DA

**Document history**

- 120622 Revised and extended. Preliminary.
- 120615 Preliminary.

---

# 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 : 2009 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: [support@iqrf.org](mailto:support@iqrf.org)**

---



Smarter wireless. Simply.