

# **TR-54D**

## **Transceiver Module**

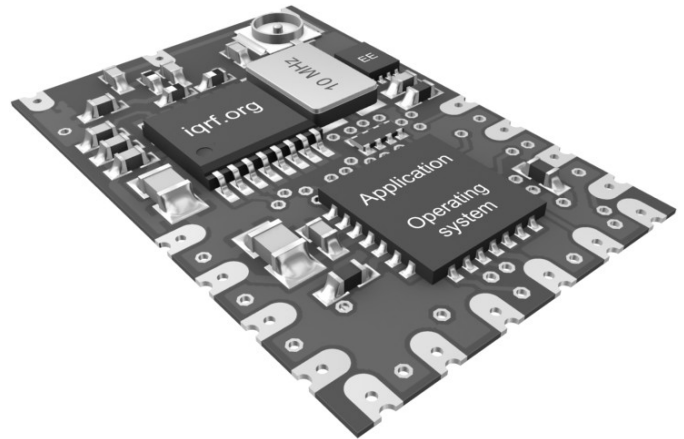
# **Data Sheet**

***Preliminary***



## Description

TR-54D 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.



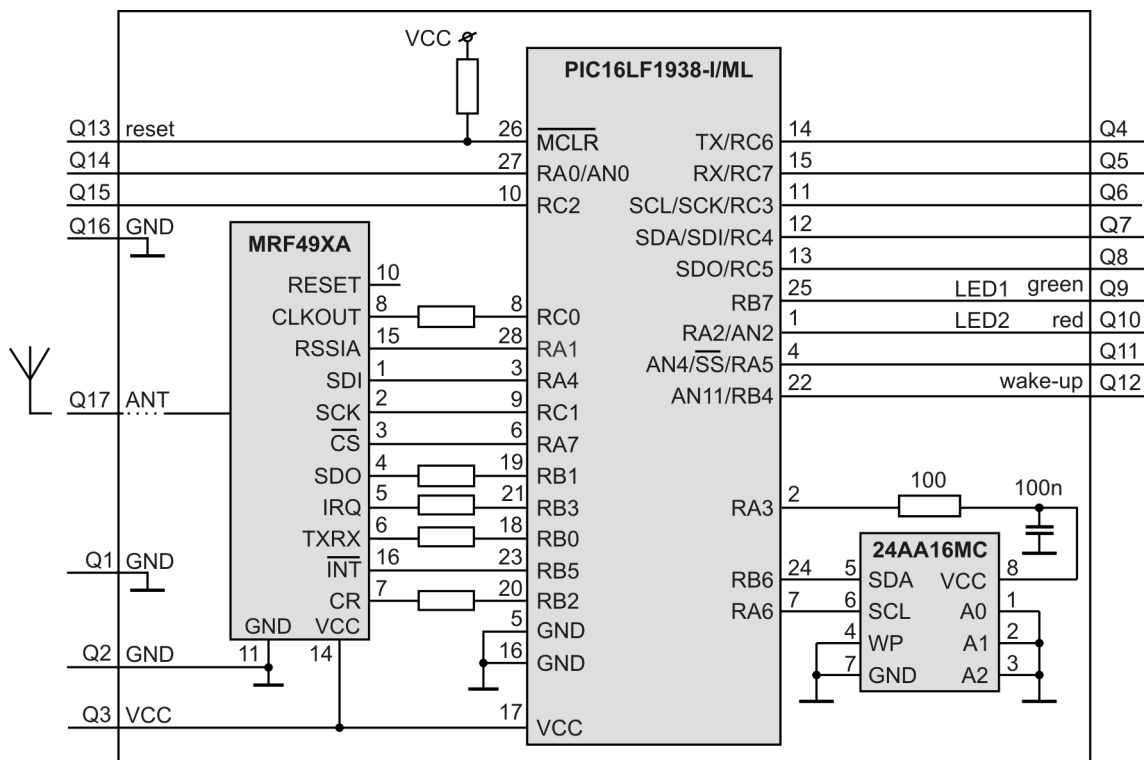
## Applications

- 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
- 11 I/Os, 3 A/D inputs
- Stamp hole pads, SMT mounting
- Options: U.FL connector, serial EEPROM
- Low cost

## Simplified schematics



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

Supply voltage ( $V_{CC}$ )	3.0 V $\pm$ 0.1 V
Operating temperature	0 °C to +70 °C -40 °C to +85 °C (Industrial) available on request
Supply current	
Sleep mode	900 nA (all peripherals including MRF49XA disabled)
Run mode	1.8 mA (MRF49XA disabled)
Rx mode	13 mA (STD mode) 400 $\mu$ A (LP mode <sup>2</sup> ) 35 $\mu$ A max. (XLP mode <sup>2</sup> )
Tx mode	14 mA – 24 mA (according to RF output power)
RF sensitivity <sup>1</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
Frequency bands	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-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
Input voltage on Q4 to Q15 pins	0 V to $V_{CC}$
A/D converter	10 b, 3 inputs (multiplexed S&H, successive approximation)
Input A/D impedance	10 k $\Omega$ max.
Size (L x W x H)	22.5 mm x 14.9 mm x 3.0 mm

**Note 1:** RF sensitivity depends on frequency band and bit rate.

**Note 2:** 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.

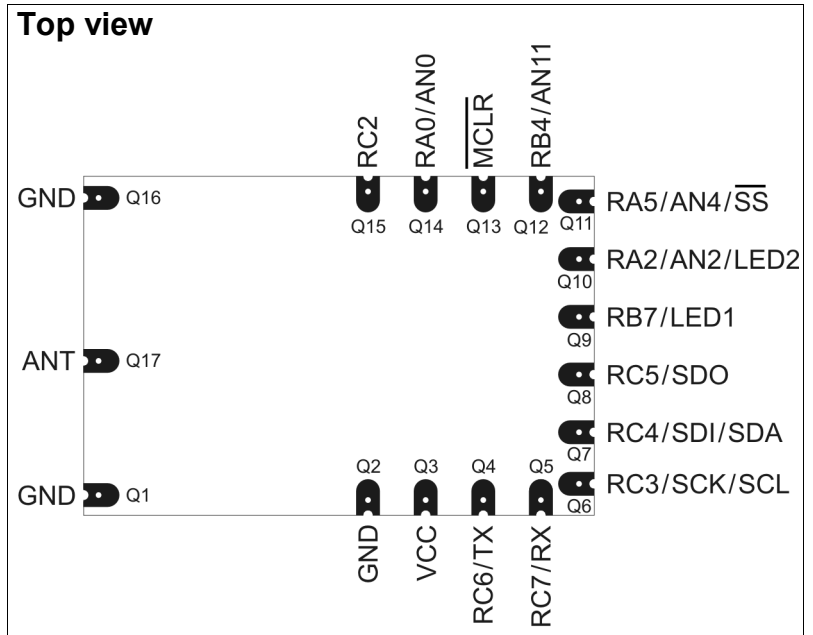
Supply voltage ( $V_{CC}$ )	4 V
Voltage on Q4 to Q15 pins	-0.3 V to ( $V_{CC}$ + 0.3 V)
Storage temperature	-50 °C to +100 °C
Ambient temperature under bias	-40 °C to +85 °C

**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	Optional
<b>Antenna connector</b>	U.FL-R-SMT(01), KON-U.FL-R-SMT	Hirose	Optional, for CAB-U.FL or CAB-U.FL/SMA

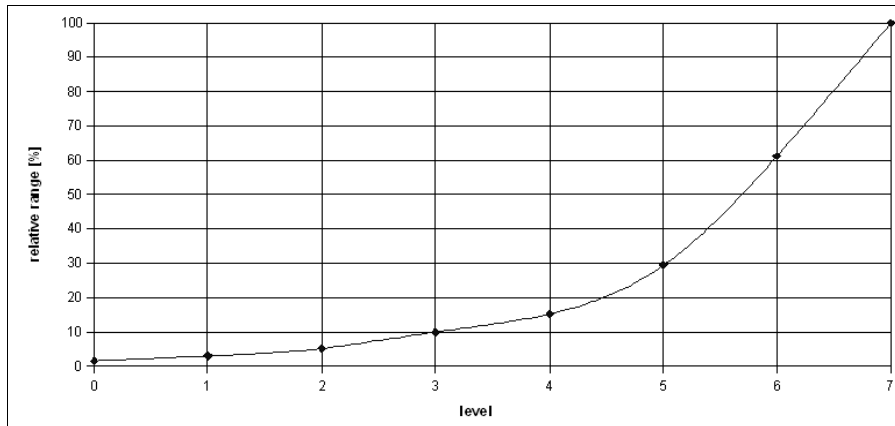
For more information refer to respective datasheets.

Pin	Name	Description
Q1	<b>GND</b>	Ground
Q2	<b>GND</b>	Ground
Q3	<b>VCC</b>	Power supply voltage
Q4	<b>IO/ TX</b> RC6 TX	General I/O pin UART TX
Q5	<b>IO/RX</b> RC7 RX	General I/O pin UART RX
Q6	<b>IO/SCK/SCL</b> RC3 SCK SCL	General I/O pin SPI clock input I <sup>2</sup> C clock
Q7	<b>IO/SDI/SDA</b> RC4 SDI SDA	General I/O pin SPI data I <sup>2</sup> C data
Q8	<b>IO/RX/SDO<sup>5</sup></b> RC5 SDO	General I/O pin SPI data out
Q9	<b>IO/ LED1</b> RB7 <sup>6</sup> LED1	General I/O pin LEDR supported by OS
Q10	<b>IO/AN/ LED2</b> RA2 AN2 LED2	General I/O pin Analog A/D input LEDR supported by OS
Q11	<b>IO/AN/-SS</b> RA5 AN4 -SS	General I/O pin, Analog A/D input SPI Slave select
Q12	<b>IO/ AN</b> RB4 <sup>6</sup> AN11	General I/O pin Analog A/D input
Q13	<b>-MCLR</b>	TR reset (active low)
Q14	<b>IO/ AN</b> RA0 AN0	General I/O pin Analog A/D input
Q15	<b>IO</b> RC2	General I/O pin
Q16	<b>GND</b>	Ground
Q17	<b>ANT</b>	Antenna

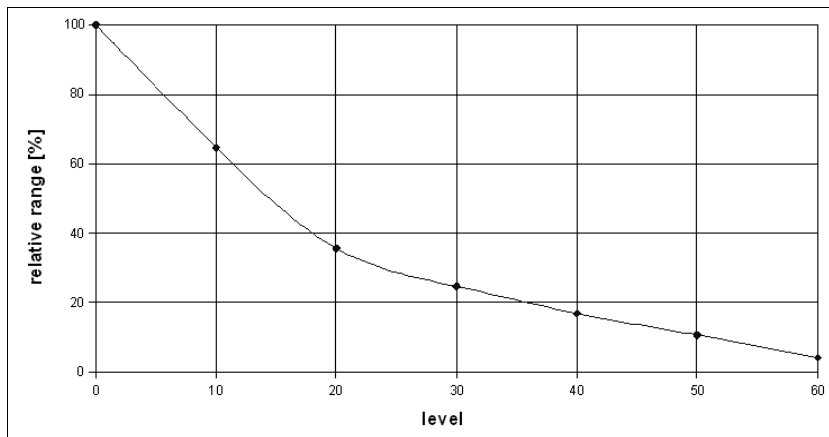


**Note 5:** This pin is used as output during initial ~250 ms boot-up to recognize programming mode.

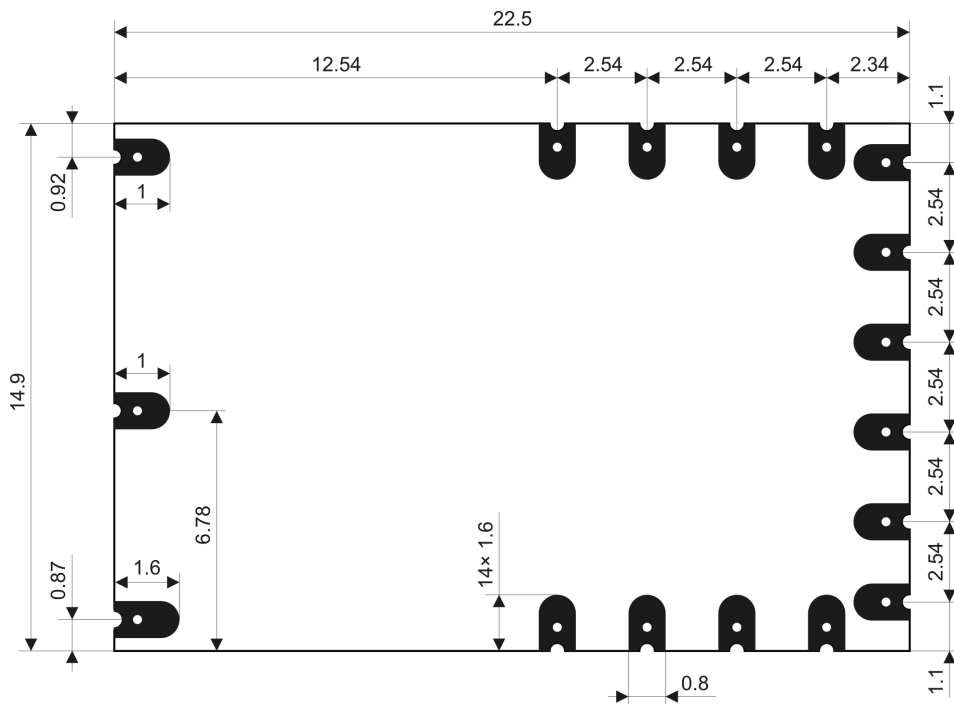
**Figure 1:** Relative RF range vs. level for the `setTXpower(level)` function. Refer to IQRF OS Reference guide.



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



## Dimensions

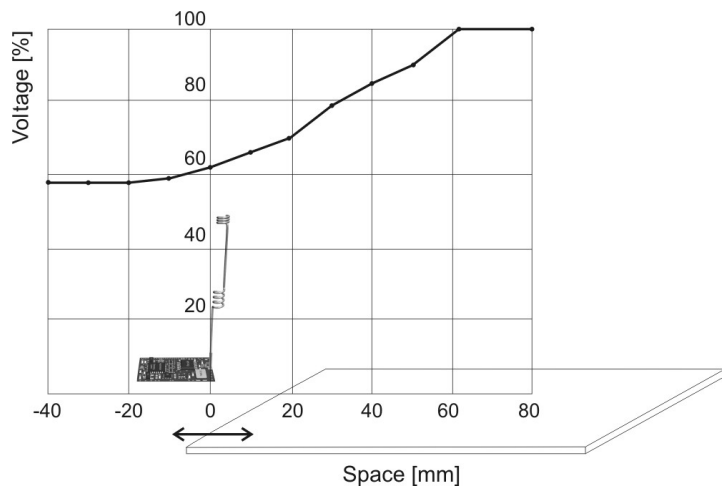


Top view, units: mm

## Application

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

**Figure 3:** Relative decrease of RF input signal vs. antenna edge spacing to conductive areas.



Conductive areas close to the antenna must be avoided.  
Recommended minimal spacing is 10 mm.

## Product information

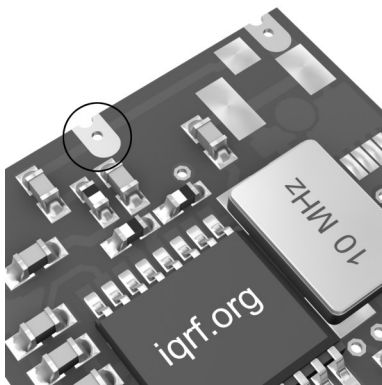
### Ordering codes

**T R - 5 4 D A PP**

- peripheral options: **nil** - no serial EEPROM
- E** - serial EEPROM
- antenna options: **nil** - soldering hole (no antenna, no U.FL connector)
- A** - PCB antenna,
- C** - U.FL connector (mini coax)

Examples:

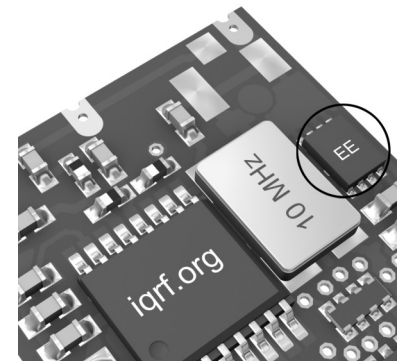
Type	Antenna connector	Serial EEPROM
<b>TR-54D</b>	Soldering hole	-
<b>TR-54DC</b>	U.FL connector	-
<b>TR-54DE</b>	Soldering hole	Yes
<b>TR-52DCE</b>	U.FL connector	Yes



TR-54D



TR-54DC



TR-54DE

### Document history

- 111011 Preliminary

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# Sales and Service

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## Partners and distribution

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## 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)*



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