TR-55D

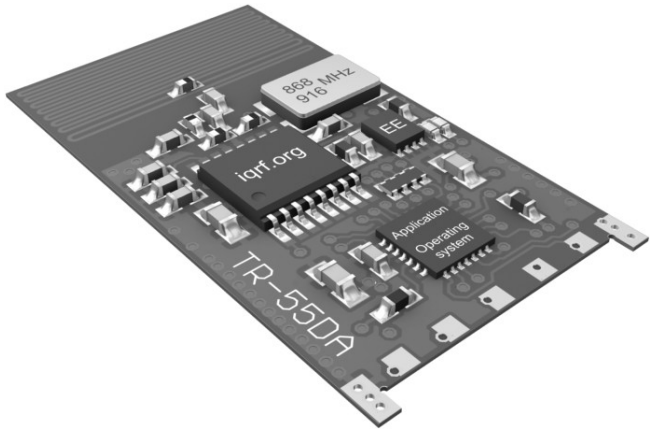
Transceiver Module

Data Sheet

Smarter wireless. Simply.

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.



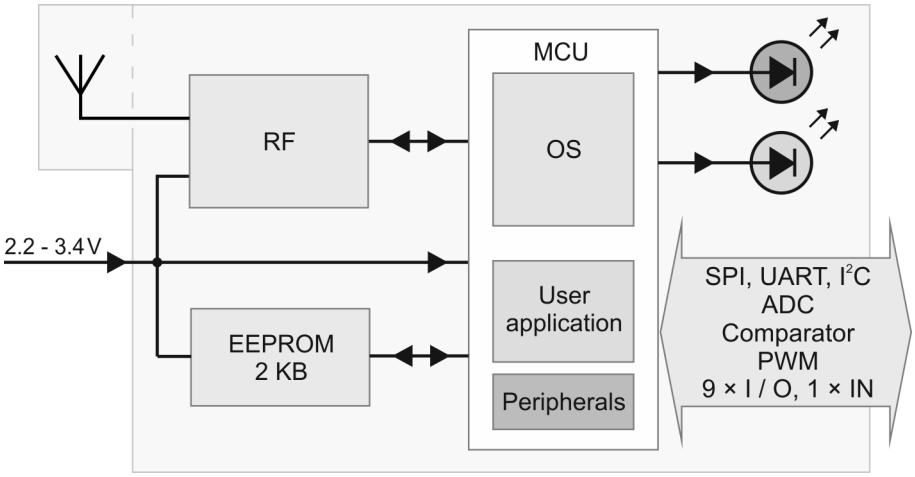
Key features

- Complete solution with operating system, easy to use
- FSK modulation
- Selectable band 868 / 916 MHz, multiple channel
- MCU with extended resources, user interrupt capability
- Extra low power consumption, power management modes
- SPI interface supported by OS on background
- Serial EEPROM
- PWM output
- Programmable HW timer
- Battery monitoring
- 12 pins, 9 I/Os
- A/D converter (3 channels)
- Analog comparator
- Vertical mounting, SIM card compatible
- Small dimensions

Applications

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

Block diagram



Electrical specifications

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

Supply voltage (V_{cc}) [1]	2.2 V min., 3.4 V max., **3.0 V typ**., 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 [4])
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 [5]) 35 µA (XLP mode [5])
Tx mode	14 mA – 24 mA (according to RF output power)
RF sensitivity [2]	-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) [3]	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 2.0 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.

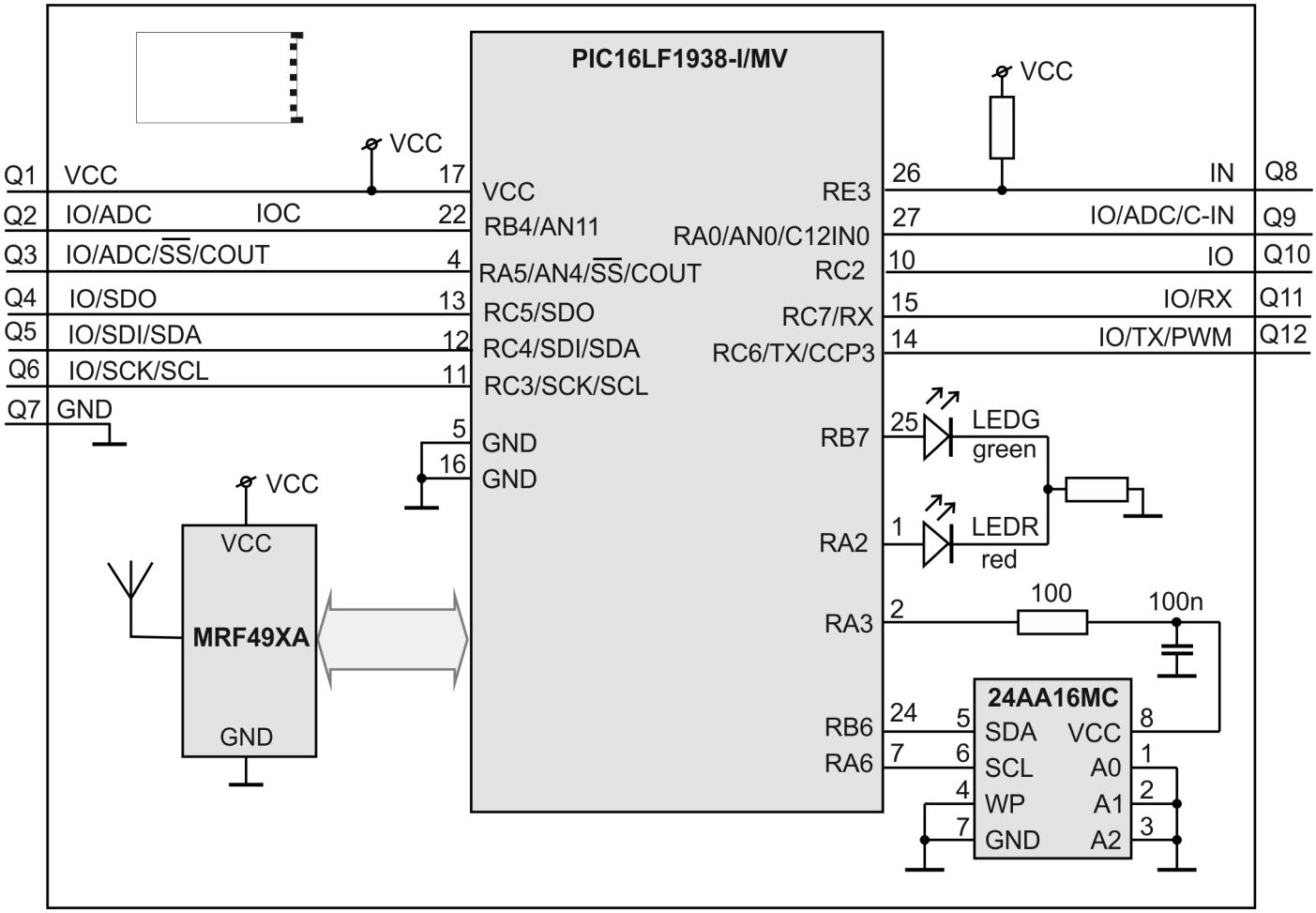
Absolute maximum ratings

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

Caution: TR-55Dx must not be plugged in devices like DK-EVAL-04 which are intended for TR modules with LDO only.

Simplified schematics



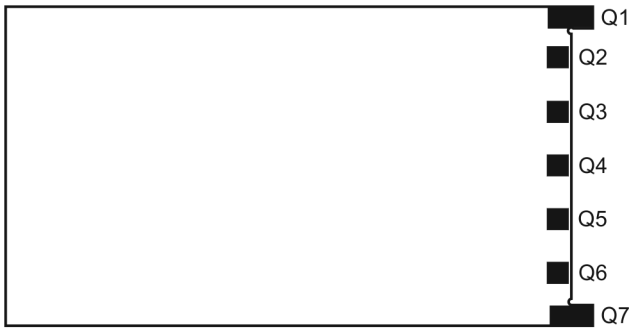
Basic parts

Part	Type	Manufacturer	Note
MCU	PIC16LF1938–I/ML	Microchip	
RF IC	MRF49XA	Microchip	
EEPROM	24AA16/MC	Microchip	2 kB

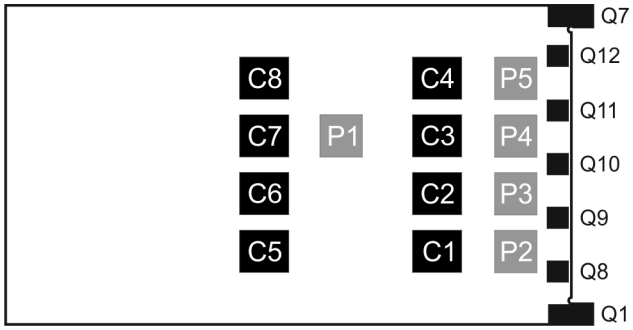
For more information refer to respective datasheets.

Pin	Name	Description
Q1, C3	**VCC**	Power supply voltage
Q2	**IO / ADC**	
	RB4	General I/O pin, programmable pull-up and interrupt/wake-up on change (IOC)
	AN11	Analog A/D input
Q3, C5	**IO / ADC / -SS / COUT**	
	RA5	General I/O pin,
	AN4	Analog A/D input
	–SS	SPI Slave select
	C2OUT	Comparator output
Q4[6], C8	**IO / SDO**	
	RC5	General I/O pin
	SDO	SPI data out
Q5, C7	**IO / SDI / SDA**	
	RC4	General I/O pin
	SDI	SPI data
	SDA	I²C data
Q6, C6	**IO / SCK / SCL**	
	RC3	General I/O pin
	SCK	SPI clock input
	SCL	I²C clock
Q7, C4	**GND**	Ground
Q8	**IN**	
	RE3	General input only pin
Q9, C1	**IO / ADC / C-IN**	
	RA0	General I/O pin
	AN0	Analog A/D input
	C12IN0	Comparator –input
Q10, C2	**IO**	
	RC2	General I/O pin
Q11	**IO / RX**	
	RC7	General I/O pin
	RX	UART RX
Q12	**IO / TX / PWM**	
	RC6	General I/O pin
	TX	UART TX
	CCP3	PWM output
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.

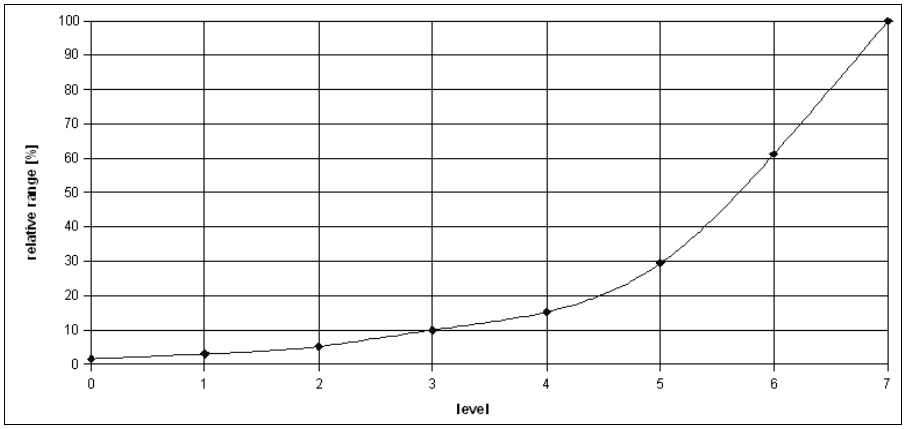


Figure 2: Relative RF range vs. level for the `checkRF(level)` detection. Refer to IQRF OS Reference guide.

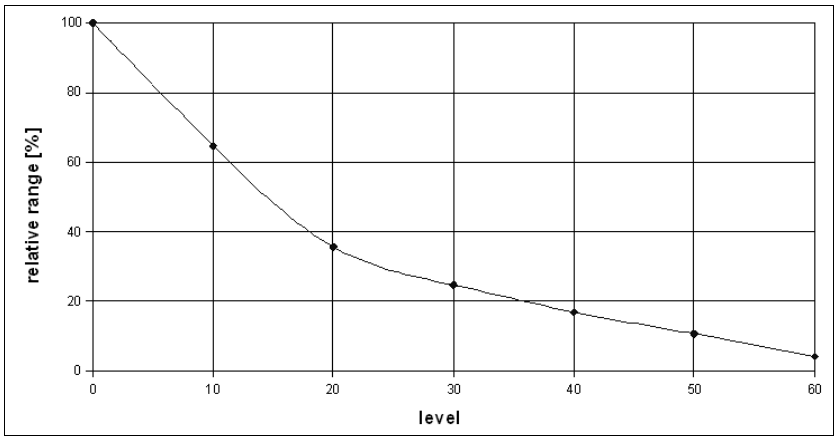
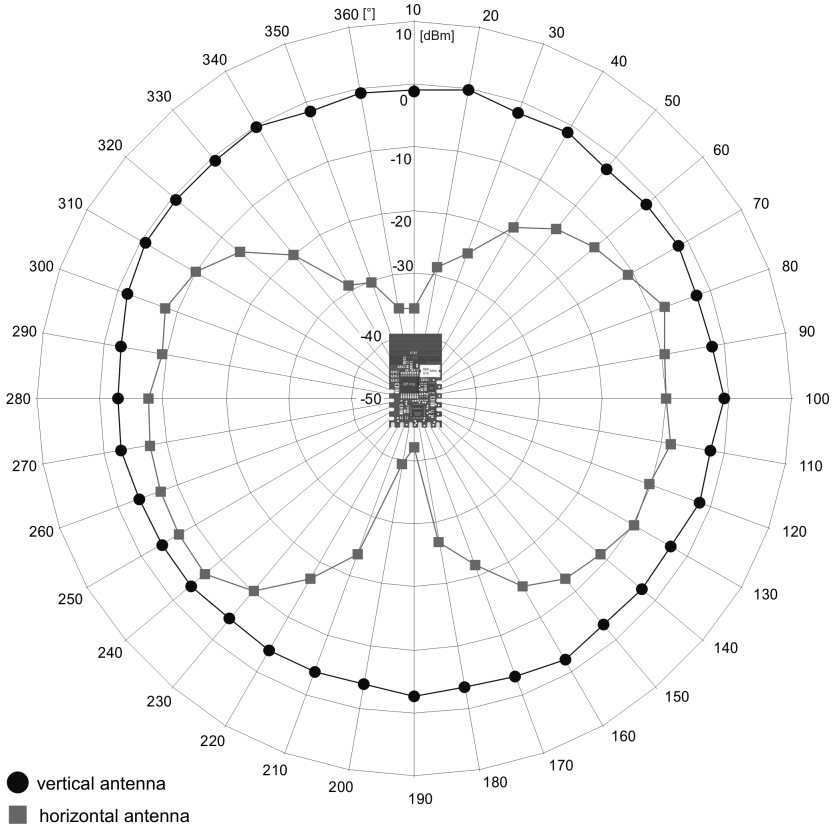


Figure 3: Relative RF range vs. antenna orientation (radiation patterns)



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

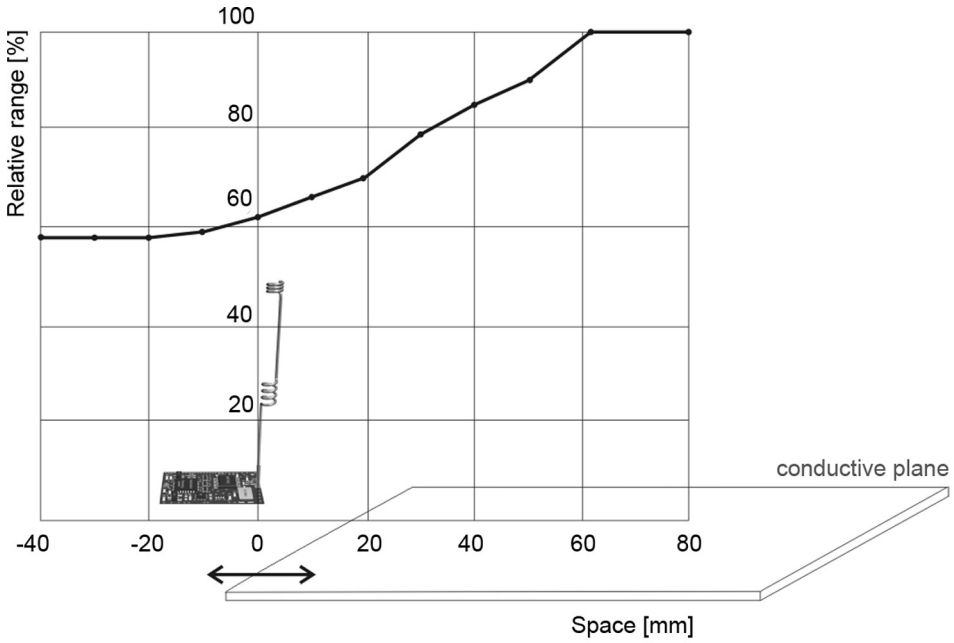
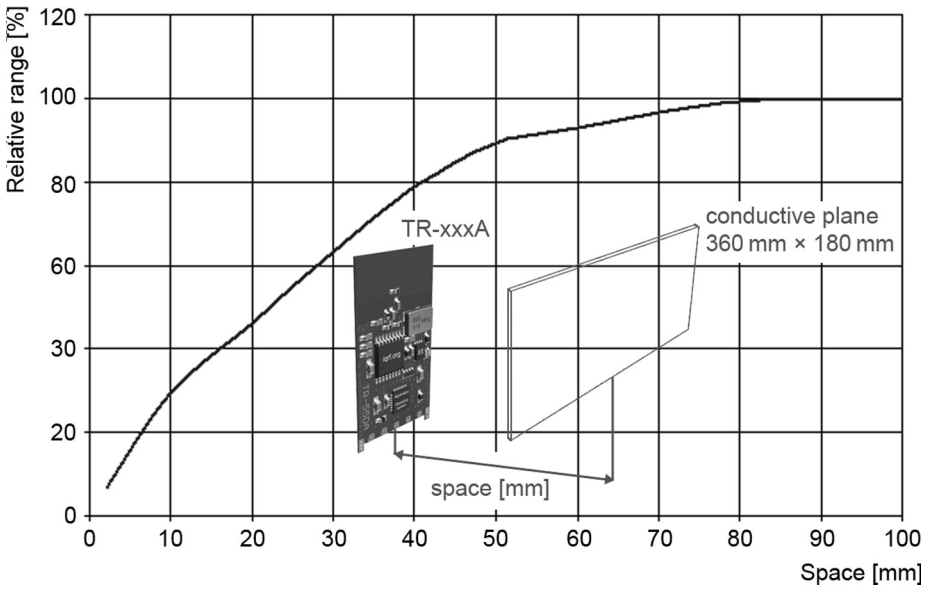
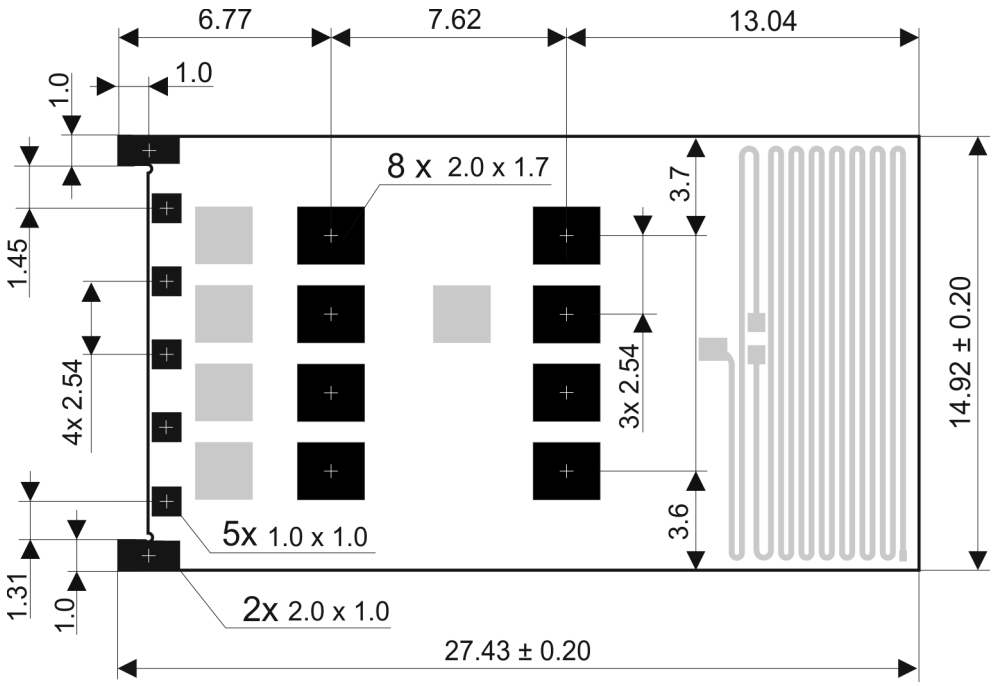


Figure 5: Parallel arrangement



Mechanical drawings

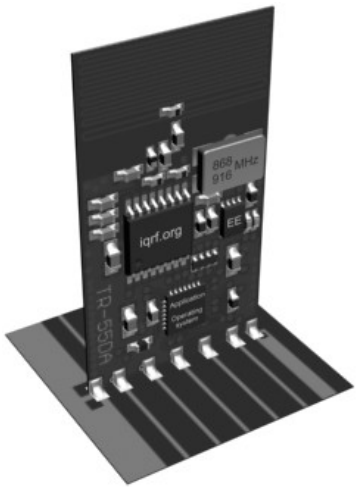
TR-55DA

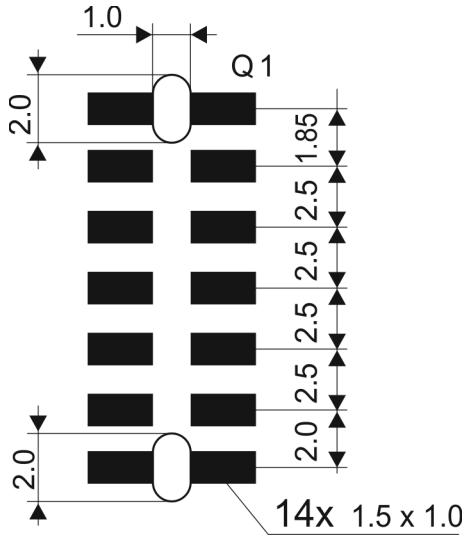


Top view, units: mm

Application

Vertical mounting





Top view, units: mm

Recommended PCB layout for user application

SIM connector

TR-55Dx can be mounted in SIM connector like other SIM card format TR modules. But it must not be plugged in devices like DK-EVAL-04 with power supply out of the TR-55Dx range. Such kits are intended for TR modules with LDOs only. For using TR-55Dx with such kits the KON-LDO-01 adapter is intended. See the KON-LDO-01 User's guide.

Operating system

See IQRF OS User's guide and IQRF OS Reference guide.

Software

See Application examples www.iqrf.org website.

Programming

There are two possibilities to upload a user program in TR-54Dx modules soldered in an application:

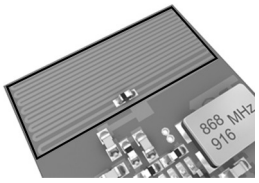
- For wired upload using the CK-USB-04 programmer the KON-PGM-01 adapter is intended. See the KON-PGM-01 User's guide for details.
- RFPGM – RF programming™ (wireless upload). See the IQRF OS User's guide, chapter *RF programming*.

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

- 121102 First release.

Sales and Service

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Partners and distribution

Please visit 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

Legal

On-line support: support@iqrf.org

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