

TR-55D

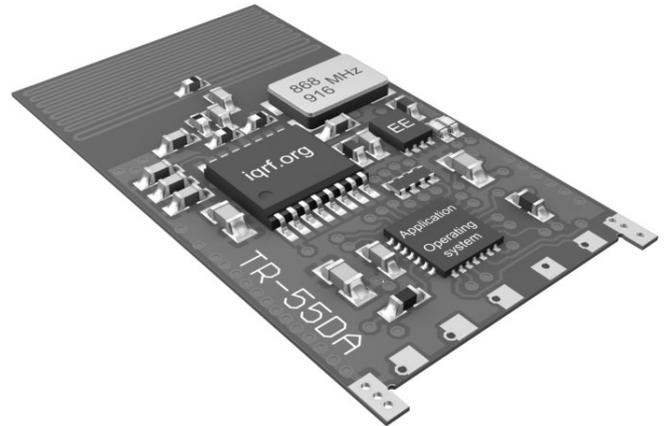
Transceiver Module

Data Sheet



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.



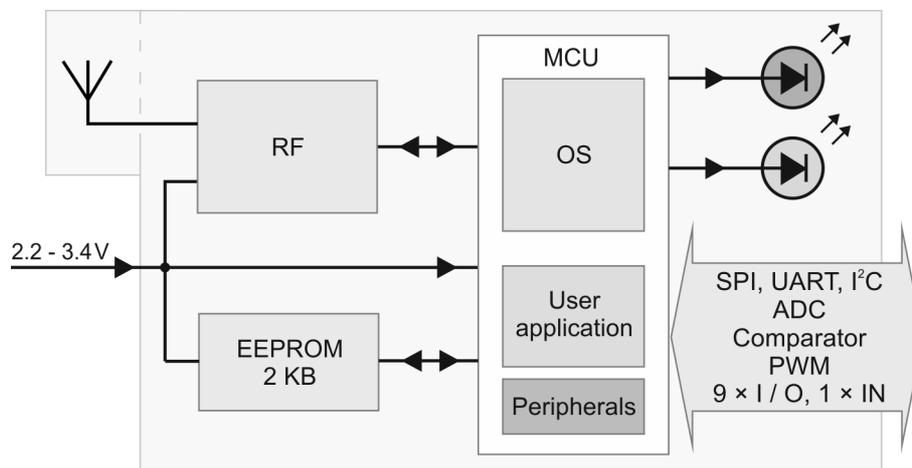
Key features

- 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



Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

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Electrical specifications
Typical values unless otherwise stated

Parameters specified in this datasheet are typical values. They are at power supply $V_{CC} = 3\text{ V}$ only. V_{CC} voltage different from 3 V can impact on RF range and other parameters.

Supply voltage (V_{CC}) ¹	2.2 V min., 3.4 V max., 3.0 V typ. , stabilized.																		
Operating temperature ²	-40 °C to +85 °C																		
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	STD mode: 13 mA LP mode ⁵ : OS v3.01D: 400 µA, from OS v3.02D: 330 µA XLP mode ⁵ : OS v3.01D: 35 µA, from OS v3.02D: 25 µA																		
Tx mode	14 mA – 24 mA (according to RF output power)																		
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 ⁶ , 19.2 kb/s, 57.6 kb/s ⁶ , 86.2 kb/s ⁶																		
RF sensitivity	Depends on frequency band and bit rate:																		
	<table border="1"> <thead> <tr> <th></th> <th>bit rate [kb/s]</th> <th>1.2⁶</th> <th>19.2</th> <th>57.6⁶</th> <th>86.2⁶</th> </tr> </thead> <tbody> <tr> <td rowspan="2">RF sensitivity [dBm]</td> <td>868 MHz</td> <td>-110</td> <td>-104</td> <td>-99</td> <td>-92</td> </tr> <tr> <td>916 MHz</td> <td>-109</td> <td>-102</td> <td>-97</td> <td>-90</td> </tr> </tbody> </table>		bit rate [kb/s]	1.2 ⁶	19.2	57.6 ⁶	86.2 ⁶	RF sensitivity [dBm]	868 MHz	-110	-104	-99	-92	916 MHz	-109	-102	-97	-90	
	bit rate [kb/s]	1.2 ⁶	19.2	57.6 ⁶	86.2 ⁶														
RF sensitivity [dBm]	868 MHz	-110	-104	-99	-92														
	916 MHz	-109	-102	-97	-90														
RF output power	Programmable in 8 levels (0 – 7), -2.5 dBm/level																		
	<table border="1"> <thead> <tr> <th>level</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> </tr> </thead> <tbody> <tr> <td>[dBm]</td> <td>-12.5</td> <td>-10</td> <td>-7.5</td> <td>-5</td> <td>-2.5</td> <td>0</td> <td>2.5</td> <td>5</td> </tr> </tbody> </table>	level	0	1	2	3	4	5	6	7	[dBm]	-12.5	-10	-7.5	-5	-2.5	0	2.5	5
level	0	1	2	3	4	5	6	7											
[dBm]	-12.5	-10	-7.5	-5	-2.5	0	2.5	5											
RF range (TR-52DA) ³	Up to 850 m @ 1.2 kb/s Up to 650 m @ 19.2 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 range may change with lower temperature. Frost, condensation or humidity over 85% may disable module functionality. Module suitability should be tested in final application before volume use.

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.

Note 6: Bit rates different from 19.2 kb/s are preliminary, for experimental purpose only.

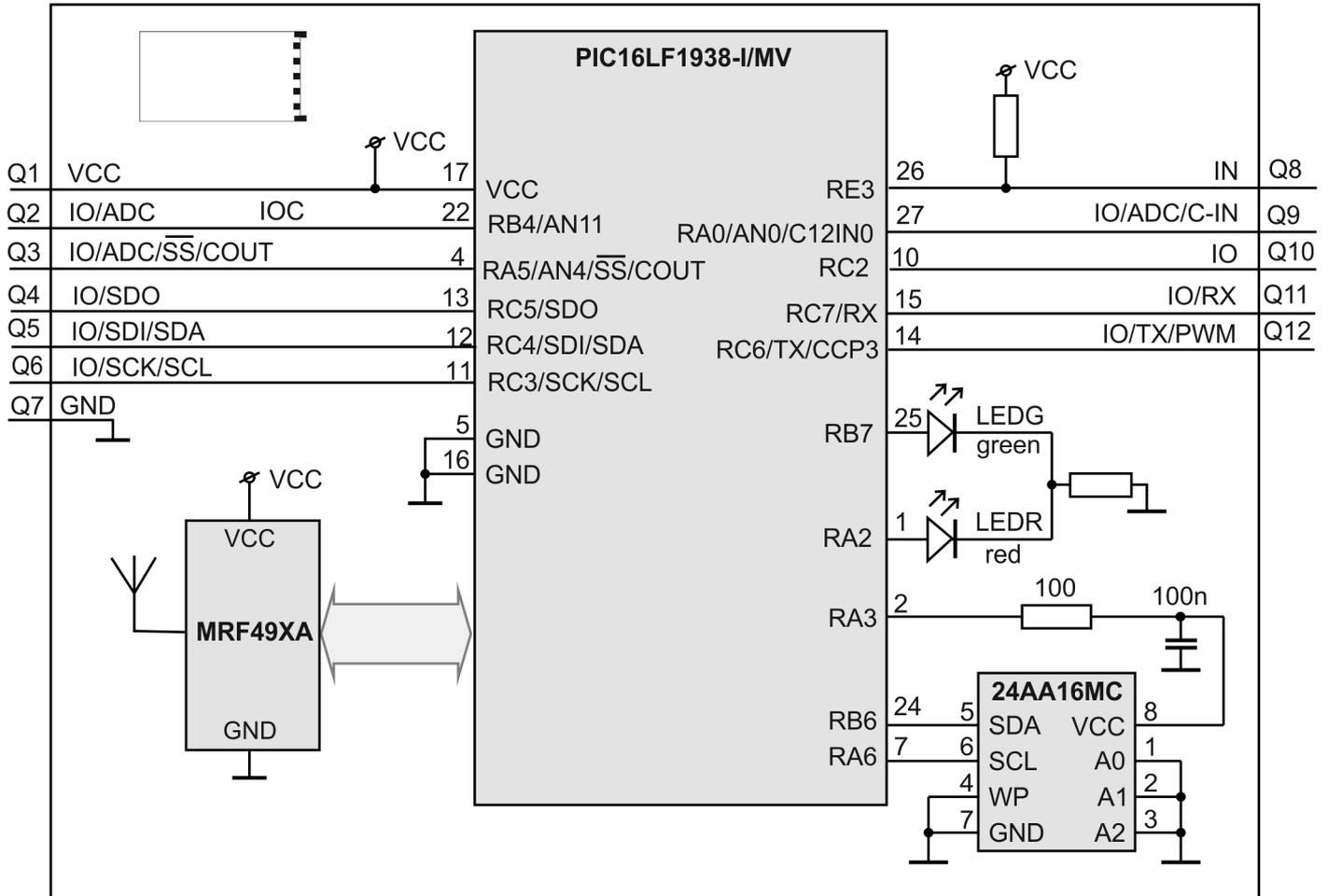
Users have to ensure observing local provisions and restrictions relating to the use of short range devices by software, e.g. the CEPT ERC/REC 70-03 Recommendation and subsequent amendments in EU.

Caution: *Electrostatic sensitive device. Observe appropriate precautions for handling*

Absolute maximum ratings

Stresses above listed maximum values may cause permanent damage to the device and affect device reliability. Functional operation at these or any other conditions beyond those specified is not supported.

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
MCU	PIC16LF1938-I/ML	Microchip	
RF IC	MRF49XA	Microchip	
EEPROM	24AA16/MC	Microchip	2 kB

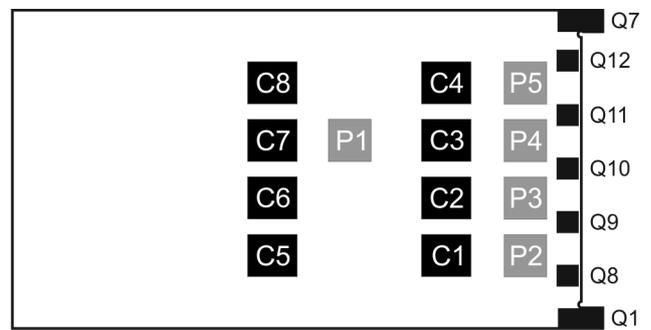
For more information refer to respective datasheets.

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 ⁷ , 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	I ² C data
Q6, C6	IO/SCK/SCL	
	RC3	General I/O pin
	SCK	SPI clock input
	SCL	I ² C 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

Top view



Bottom view



P1-P2 For manufacturer only

Note 7: 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.

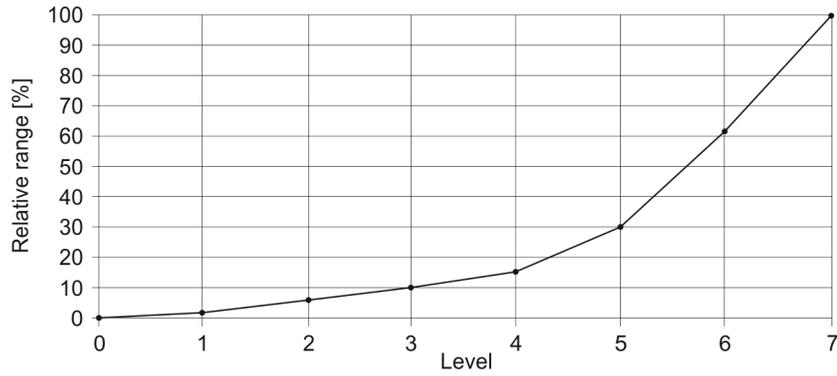


Figure 2: Relative RF range vs. level for the `checkRF(level)` detection. Refer to IQRF OS Reference guide.

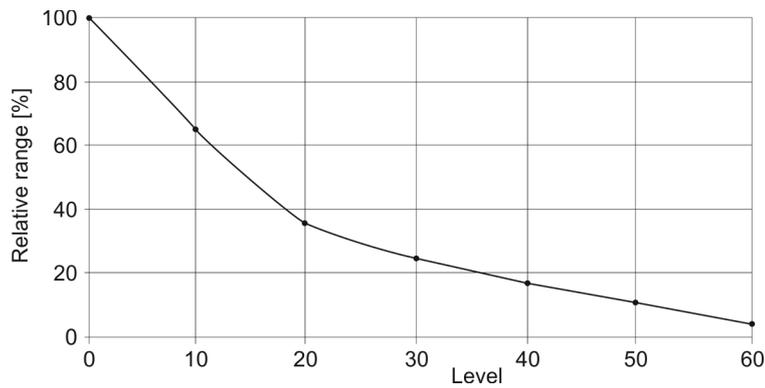
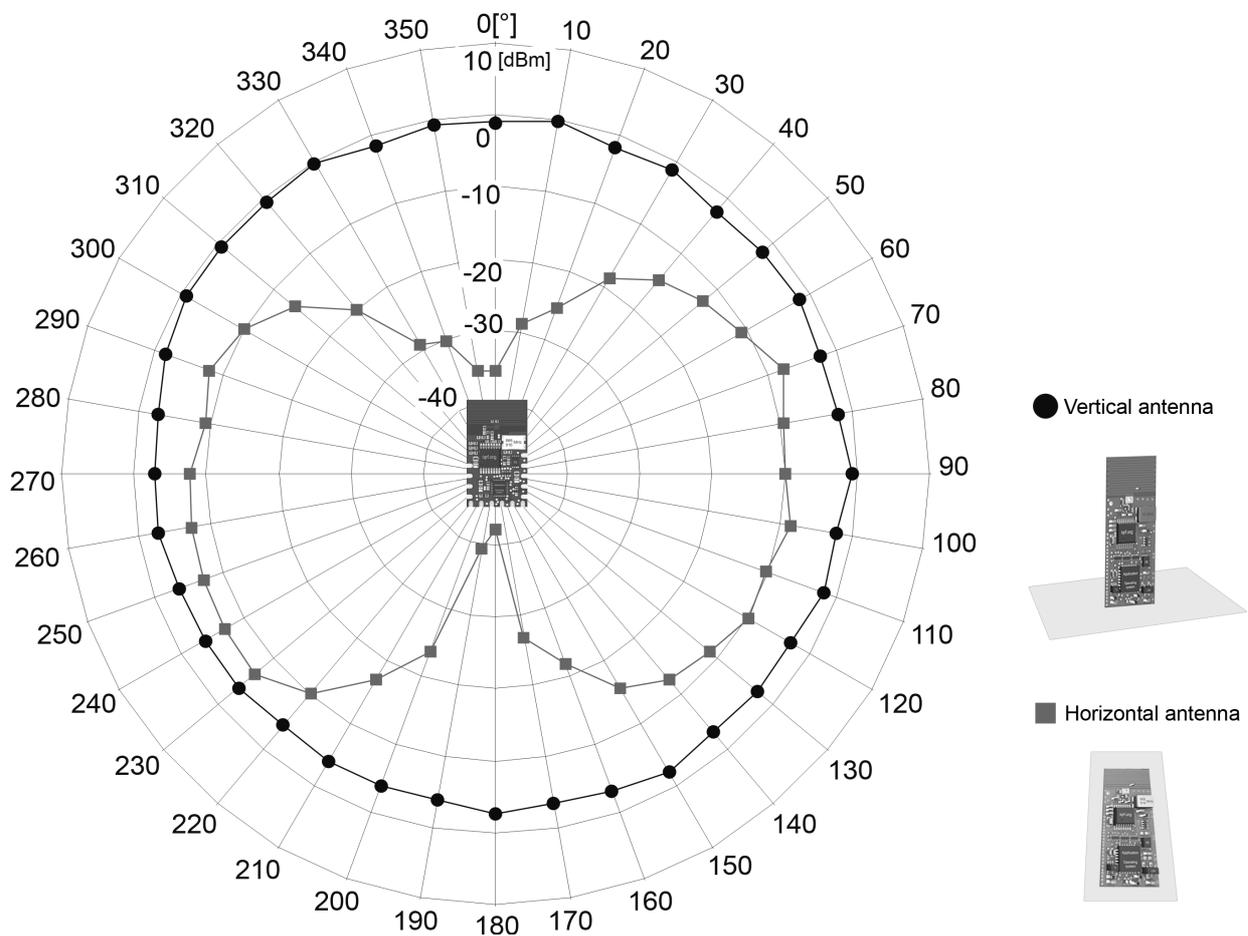


Figure 3: Relative RF range vs. antenna orientation (radiation patterns)



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

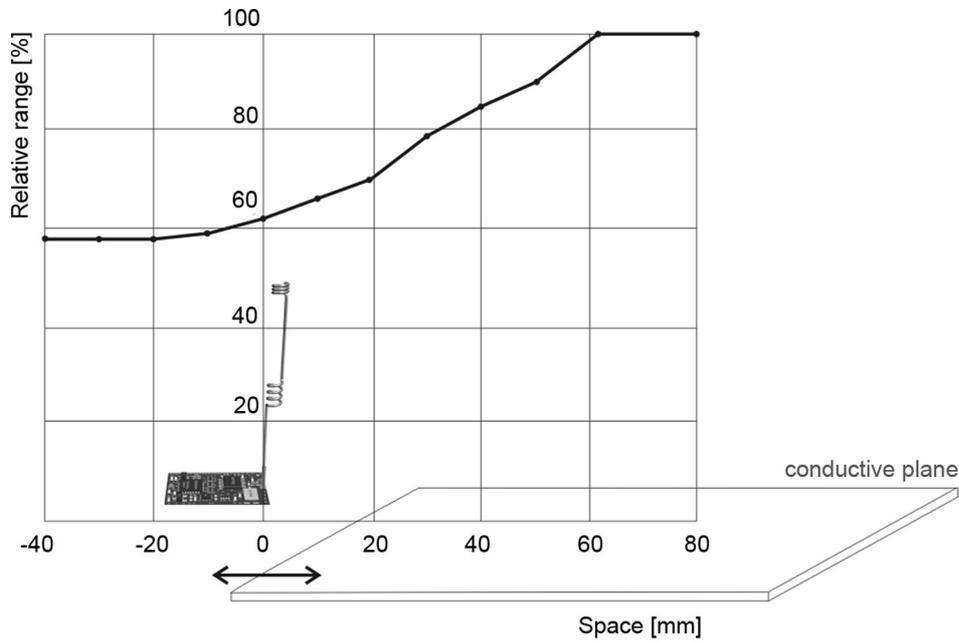
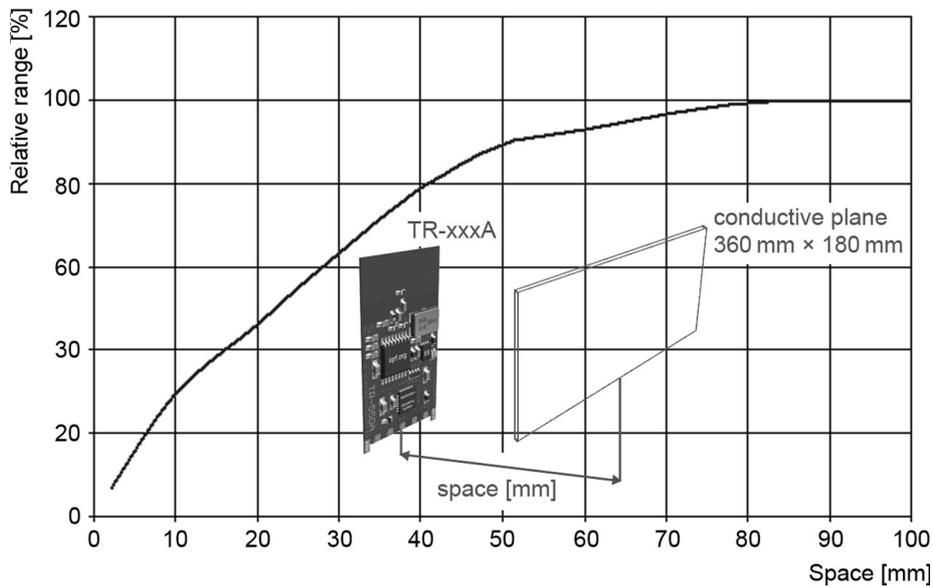
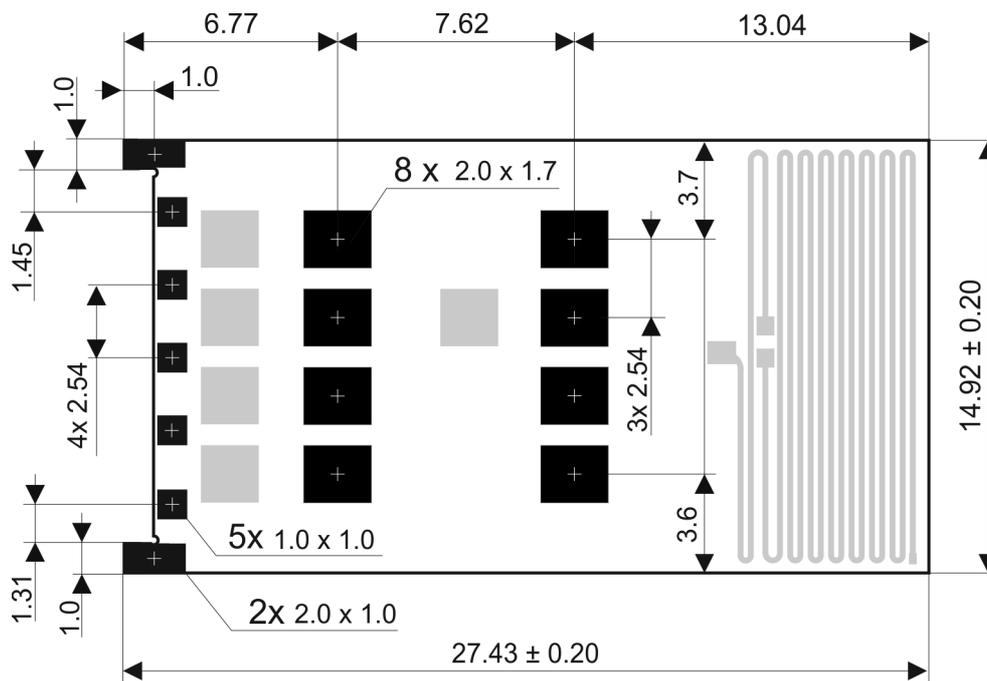


Figure 5: Parallel arrangement



Mechanical drawings

TR-55DA

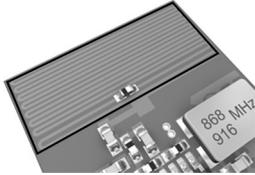


Product information

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

- 130607 Operational temperature range extended.
- 130405 Revised. Chapters *Specifications* and *Application* precised.
- 121102 First release.

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Corporate office

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Tel: +420 493 538 125, Fax: +420 493 538 126, www.microrisc.com

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