TR-56D

Transceiver Module

Data Sheet





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. SMT mounting and very small dimensions allow space saving.

Key features

- Complete solution with operating system, easy to use
- FSK modulation
- Selectable RF 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
- 18 pins, 11 I/Os, 1 input only
- A/D converter (4 channels), D/A converter
- Analog comparator
- · Optional on-board antenna
- Stamp hole pads, SMT mounting, no SIM card compatible
- Very small dimensions

Block diagram



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





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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 (Vcc) ¹	2.2 V min., 3.4 V max., 3.0 V typ ., stabilized.								
Operating temperature ² Supply current	-40 °C t	o +85 °C							
Sleep mode Additional supply current	380 nA 800 nA 7.5 μA ((if all pei (if watch if brown·	ripherals dog ena -out dete	incluc bled) ection	ling MRF49 enabled))XA disa	bled 4))	
Run mode Additional supply current	1 mA (M 0.6 mA	1RF49X/ (MRF49	A disable XA on)	ed)					
Rx mode	STD mo LP mod XLP mo	ode: 13 r e ⁵: OS ode ⁵: OS	nA v3.01D: S v3.01D	400 μ 2 35 μ	A, from OS A, from OS	v3.02D v3.02D	: 330 µ : 25 µ/	AL A	
Tx mode	14 mA -	14 mA – 24 mA (according to RF output power)							
Nominal frequency Channels RF data modulation RF data transmission bit rate	868.35 MHz or 916.50 MHz (software selectable) See IQRF OS User's guide, Appendix 2, Channel maps FSK (frequency-shift keying) 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:								
			bit rate	[kb/s]	1.2 ⁶	19	.2	57.6 ⁶	86.2 ⁶
	RF ser	nsitivity	868 M	lHz	-110	-1	04	-99	-92
	[dE	3m]	916 MHz		-109	-1	02	-97	-90
RF output power	Progran	nmable i	n 8 level	s (0 –	7), -2.5 dB	m/level			
	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-56DA) ³	Up to 85 Up to 65	50 m @ 50 m @	1.2 kb/s 19.2 kb/s	6 S					
Input voltage on Q4 to Q15 pins	0 V to V	сс							
A/D converter Input A/D impedance	10 bit, 4 10 kΩ n	inputs (nax.	multiple	xed S&	&H, succes	sive app	roxima	ation)	
Dimensions	15.2 mm x 14.9 mm x 2.0 mm (TR-56D)								
Note 1: RF power and other parameters application with respect to requi	depend on sup ired supply volta	ply volta	age. Refe e.	er to d	atasheets o	of MCU a	and RI	FIC used.	Test you

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}) Voltage on Q4 to Q15 pins Storage temperature Ambient temperature under bias $\begin{array}{l} 4 \ V \\ -0.3 \ V \ to \ (\ V_{\rm CC} + 0.3 \ V) \\ -50 \ ^\circ C \ to \ +100 \ ^\circ C \\ -40 \ ^\circ C \ to \ +85 \ ^\circ C \end{array}$



Simplified schematic



Basic components

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

For more information refer to respective datasheets.



Pin	Name	Description										
Q1 ⁷	GND	Ground										
Q2	GND	Ground	Top view									
Q3	VCC	Power supply voltage			Q16	Q15	Q14	Q13	Q12	Q11	Q10	Q9
Q4	IO/TX/PWM RC6 TX CCP3	General I/O pin UART TX PWM output	Q17		•	0	U	U	•	•	•	0
Q5	IO/RX RC7 RX	General I/O pin UART RX										
Q6	IO/SCK/SCL RC3 SCK SCL	General I/O pin SPI clock input I²C clock										
Q7	IO/SDI/SDA RC4 SDI SDA	General I/O pin SPI data I²C data	Q18									
Q8 ⁸	IO/SDO RC5 SDO	General I/O pin SPI data out										
Q9	IO/ADC/-SS/CO RA5 AN4 -SS C2OUT	DUT General I/O pin, Analog A/D input SPI Slave select Comparator output	Q1			Q2	Q3	Q4	Q5	Q 6	Q7	Q 8
Q10	IO/ LEDG RB7 LED1	General I/O pin, programmal LEDR supported by OS	ble pull-up and i	nterrupt/wake	e-up on ch	ange	(IOC))				
Q11	IO/ADC/LEDR RA2 AN2 LED2 DACOUT	General I/O pin Analog A/D input LEDR supported by OS D/A converter output										
Q12	IO / ADC RB4 AN11	General I/O pin, programmable pull-up and interrupt/wake-up on change (IOC) Analog A/D input										
Q13	IN RE3	General input only pin										
Q14	IO/ADC/C-IN RA0 AN0 C12IN0	General I/O pin Analog A/D input Comparator –input										
Q15	IO RC2	General I/O pin										
Q16	_	Do not use, leave unconnect	ed									
Q17 ⁷	GND	Ground										
Q18 ⁸	ANT	Antenna										

Note 7: Not implemented for TR-56DAx.

Note 8: 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 200 Ω series resistors on each pin.



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













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





Top view, units: mm

Application

Assembly

For proper mounting of surface mount TR-56Dx modules and avoiding damage during solder reflow assembly the IPC/JEDEC J-STD-020C standard must be observed. The parts must be baked dry according to IPC/JEDEC J-STD-033C, MSL 4 before reflow soldering. For reflow profile and details refer to the AN010 Application note – SMT mounting of IQRF TR modules.

Caution: TR-56Dx must not be plugged in a SIM connector with metallic holder.

Operating system

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

Software

See Application examples on www.iqrf.org website.

Programming

There are two possibilities to upload an application program in TR-56Dx modules soldered in an application:

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

Solderless development prototyping

For flexible development the TR-DB-56DA kit is intended. It is a removable SIM-compatible device containing the TR-56DA which can be plugged in the SIM connector in user equipment or in an appropriate IQRF development kit, e.g. DK-EVAL-04. Refer to the TR-DB-56DA User's guide for details.



Product information

Ordering codes

TR-56D<u>A</u>

-antenna options:

- ns: nil soldering pad-hole (no antenna, no U.FL connector)
 - PCB antenna

Туре	Antenna option	Serial EEPROM
TR-56D	2 kB	
TR-56DA	Internal PCB antenna	2 kB



TR-56D



TR-56DA

Document history

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- 130607 Operational temperature range extended.
 - 130405 Preliminary, for HW v1.00.



Sales and Service

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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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