

TR-72D

Transceiver Module

Data Sheet

Preliminary



Description

TR-72D 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. Microcontroller with built-in operating system, excellent development support, integrated LDO regulator, serial EEPROM and optional temperature sensor dramatically reduce time of application development. Extended RF power and sensitivity fit also range-constrained applications. Ultra low power consumption predetermines these modules for use in battery powered applications.



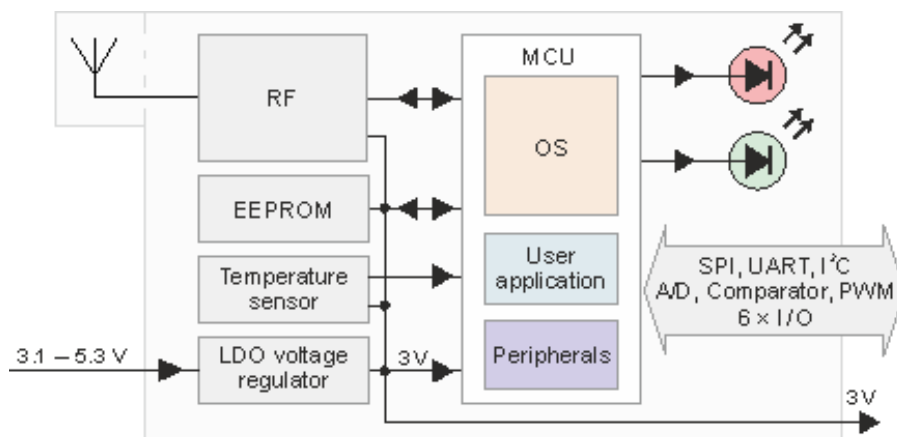
Key features

- Complete solution with operating system, easy to use
- GMSK modulation
- Selectable RF band 868 / 916 MHz, multiple channel
- Selectable RF bit rate
- RF output power 12.5 mW
- MCU with extended resources, user interrupt capability
- Extra low power consumption, power management modes
- SPI interface supported by OS in background
- Serial EEPROM 128 Kb
- PWM output
- Programmable HW timer
- +3 V LDO regulator output, battery monitoring
- 2 LEDs
- 8 pins, 6 I/Os
- A/D converter (2 channels), analog comparator
- Options: on-board antenna, U.FL connector, temperature sensor
- SIM card format
- Shielding can

Applications

- Point-to-point or network wireless connectivity
- Telemetry, AMR (automatic meter reading)
- WSN (wireless sensor network)
- Building automation
- Street lighting control
- Wireless monitoring, control and regulation
- Remote data acquisition
- RF connectivity in many other fields
- Also for municipal and indoor 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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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 $V_{OUT} = 3\text{ V}$ only. V_{OUT} voltage different from 3 V can impact on RF range and other parameters.

Supply voltage (V_{CC})	3.1 V to 5.3 V
LDO output (V_{OUT})	+3 V \pm 60 mV ($V_{CC} > 3.1\text{ V}$), 100 mA max.
Operating temperature ¹	-40 °C to +85 °C
Supply current	
Sleep mode	1.9 μ A (if all peripherals including RF IC disabled ³)
Run mode	1 mA (RF IC disabled)
Additional LED supply current	Cca 2 mA per LED. Rough value for brief guidance only.
RX mode	STD mode: 10 mA LP mode ⁴ : TBD XLP mode ⁴ : TBD
TX mode	8 mA – 22 mA (according to RF output power)
RF band	868 MHz or 916 MHz (software selectable)
RF channels	TBD
RF data modulation	GMSK (Gaussian minimum shift keying)
RF data transmission bit rate ⁵	19.8 kb/s, TBD
RFIC RF sensitivity	TBD
RFIC RF output power	11 dBm (for 50 Ω load) Programmable in 8 levels (0 – 7)
RF range (TR-72DA) ²	600 m
Input voltage on C1, C2, C5 to C8 pins	0 V to V_{OUT}
A/D converter	10 bit, 2 inputs, see MCU datasheet
Temperature sensor	MCP9808E/MC (for TR types with 'T' postfix only, e.g. TR-72DT)
Size (L x W x H)	25.0 mm x 14.9 mm x 2.0 mm 31.8 mm x 14.9 mm x 2.0 mm (TR-72DAx)

Note 1: 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 2: RF range strongly depends on module orientation and surroundings.

Note 3: Additional current is consumed when a peripheral (e.g. watchdog, Brown-out detection etc.) is enabled.

Note 4: Depends on interferences.

Note 5: RF bit rates different from 19.8 kb/s are preliminary, for experimental purpose only.

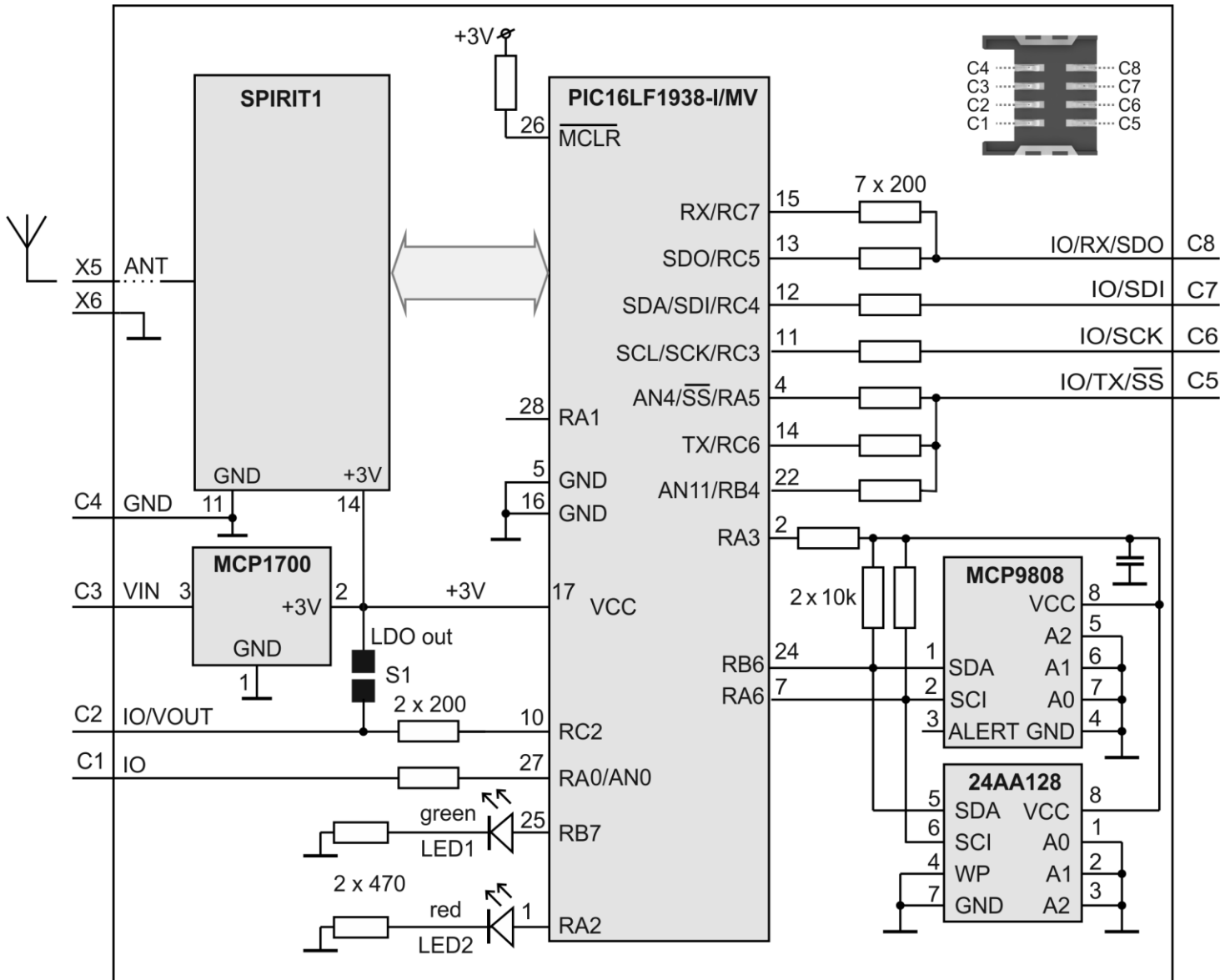
Caution: Electrostatic sensitive device. Observe appropriate precautions for handling.

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.

Absolute maximum ratings

Supply voltage (V _{CC})	5.5 V
Voltage on C1, C2, C5 to C8 pins vs. GND	-0.3 V to (V _{OUT} + 0.3 V)
Storage temperature	-40 °C to +85 °C
Ambient temperature under bias	-40 °C to +85 °C

Block diagram



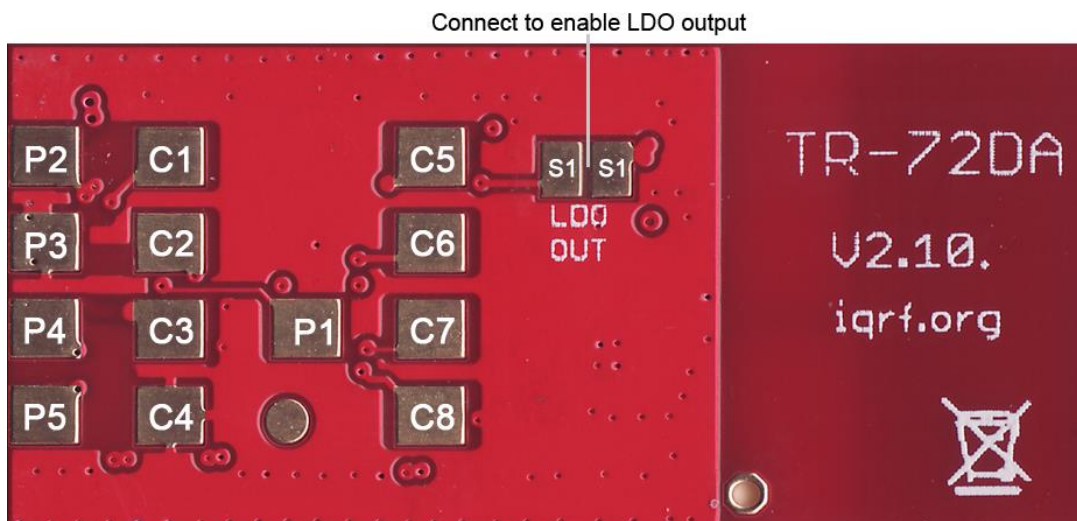
Basic components

IC	Type	Manufacturer	Note
MCU	PIC16LF1938-I/MV	Microchip	
RF IC	SPIRIT1	STMicroelectronics	
RF balun	BALF-SPI-01D3	STMicroelectronics	
LDO voltage regulator	MCP1700T-3002E/TT	Microchip	
Temperature sensor	MCP9808E/MC	Microchip	For types with 'T' postfix only, e.g. TR-72DT.
EEPROM	24AA128-I/MC	Microchip	128 Kb

For more information refer to datasheets of ICs used.

Pin	Name	Description
C1	IO/ADC/C-IN	
	RA0	General I/O pin
	AN0	Analog A/D input
	C12IN0	Comparator –input
C2	IO/VOUT	
	RC2	General I/O pin (S1 disconnected)
	VOUT	On-board +3 V LDO output (S1 connected)
C3	VIN	Power supply voltage
C4	GND	Ground
C5	IO/ADC/TX/-SS /PWM/COUT	
	RA5	General I/O pin,
	-SS	SPI Slave select
	AN4	Analog A/D input
	C2OUT	Comparator output
	RC6	General I/O pin
	TX	UART TX
	CCP3	PWM output
	RB4	General I/O pin, programmable pull-up and interrupt/wake-up on change (IOC), RFPGM termination
	AN11	Analog A/D input
C6	IO/SCK/SCL	
	RC3	General I/O pin
	SCK	SPI clock input
	SCL	I ² C clock
C7	IO/SDI/SDA	
	RC4	General I/O pin
	SDI	SPI data
	SDA	I ² C data
C8	IO/RX/SDO⁶	
	RC5	General I/O pin
	SDO	SPI data out
	RC7	General I/O pin
	RX	UART RX
X5	ANT	Antenna input
X6	GND	Ground
P1–P5		For manufacturer only
S1		LDO output enable. Connect to enable (default disabled).

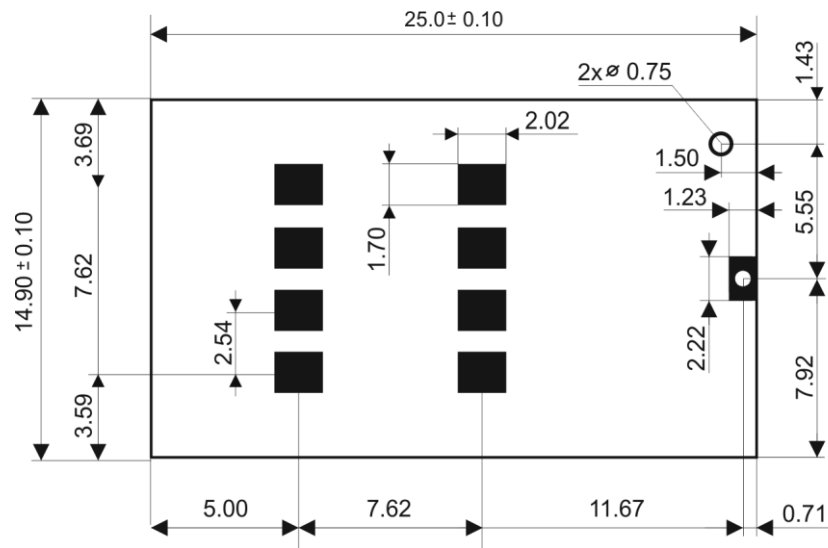
Note 6: This pin is used as output during initial ~250 ms boot-up to recognize programming mode.



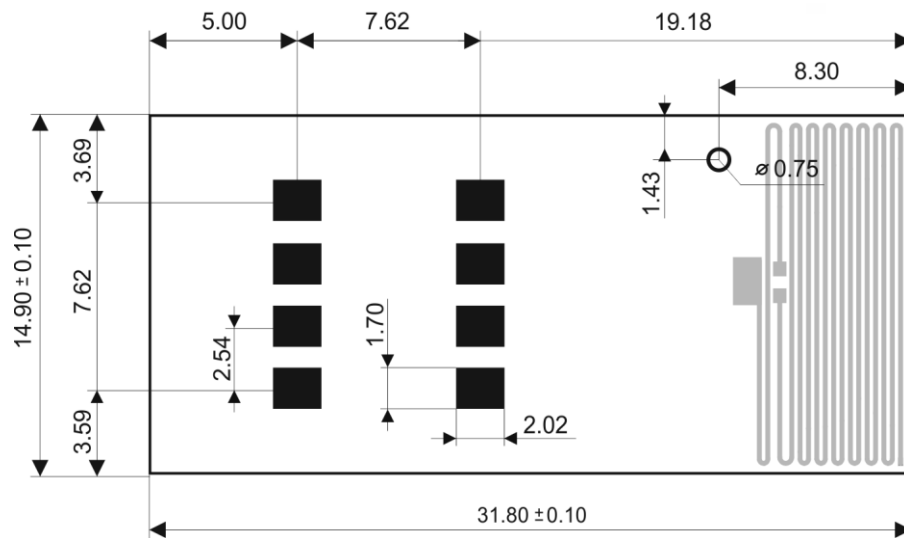
Bottom view

Dimensions

TR-72D(C)(T)



TR-72DA(T)



Top view, Units: mm

Hardware revision

- TR-72D(A) v2.10 Standard dimensions
- TR-72DA v2.02 EAP samples, length 33.8 mm.

Application

Assembly

TR-72Dx modules should be mounted in SIM connector. They are not intended for SMT reflow soldering. Recommended SIM connector: KON-SIM-01.

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 the following possibilities to upload an application program in TR-72Dx modules:

- Wired upload with TR-72Dx plugged via the SIM connector in the CK-USB-04(A) programmer.
- For TR-72Dx modules populated in an application:
 - Wired upload
 - Using the CK-USB-04A programmer. See the CK-USB-04A User's guide.
 - Using the CK-USB-04 programmer and the KON-TR-01P adapter. See the KON-TR-01P User's guide.
 - Wireless upload: See the IQRF OS User's guide, Appendix *RFPGM – RF programming™*.

In countries where FCC provision is valid, the requirements stated in CB-400-Modular Approval Checklist_JS_WIP.pdf have to be observed. Refer to www.iqrf.org/download, „FCC checklist“.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can *radiate* radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult IQRF support or an experienced local distributor technician for help.

Product information

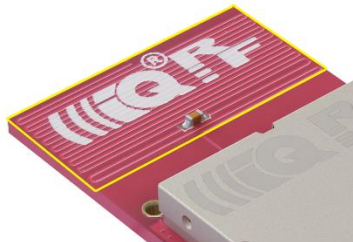
Ordering codes

TR-72D A PP

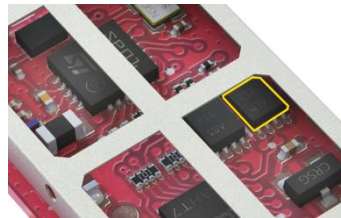
Peripheral options: **nil** - No other option
T - Temperature sensor
 Antenna options:
nil - soldering padhole (no antenna, no U.FL connector)
A - PCB antenna
C - U.FL connector (mini coax)

Type	Antenna connection	Temperature sensor
TR-72D	Soldering hole	–
TR-72DC	U.FL connector	–
TR-72DA	PCB antenna	–

Type	Antenna connection	Temperature sensor
TR-72DT	Soldering hole	Yes
TR-72DCT	U.FL connector	Yes
TR-72DAT	PCB antenna	Yes



TR-72DA



TR-72DT

Document history

- 150125 Revised. Preliminary.
- 140430 Preliminary.

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 301489-1 V1.9.2:2011, EN 301489-3 V1.6.1:2013,
EN 300220-1 V2.4.1:2012, EN 300220-2 V2.4.1:2012 and VO-R/10/04.2012-7.

Complies with FCC directives FCC CFR, Title 47, Part 15, Section 15.209, FCC CFR, Title 47, Part 15, Section 15.249.

Complies with directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE).



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