

Radio module

TRX BQ 900

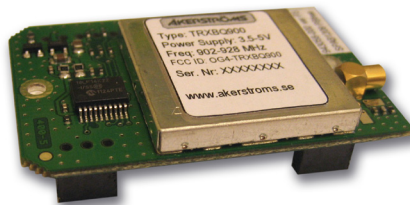


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1 Main Features

- TRX BQ 900 is a module transceiver used for remote control.
- Power is supplied to the unit with external 3.5-5 V DC power.

2 Specifications

System Specifications	
Operating frequency:	902.0875-927.9125 MHz
Channel separation:	25 kHz
Power output:	< 1 mW
Functional sensitivity:	<= -107 dBm BER 10 ⁻³
Transmission principle:	GFSK, TDMA
Operating temperature:	-25°C - +55°C
Storage temperature:	-40°C - +85°C
Radio Chip	
	FSK (GFSK)
Analog device	ADF7021
Frequency band	902.0875-927.9125 MHz
Radio Protocol	
	GFSK modulated signal
Data speed	9.6 kbit/s
Electrical Specification	
Supply voltage	3.5-5 V
Supply current	max 40 mA
VIH (Input High Voltage)	2.7-3.6 V
VIL (Input Low Voltage)	0-0.6 V
VOH (Output High Voltage)	2.7-3.3 V
VOL (Output Low Voltage)	0-0.6 V

Table 1. Technical specifications TRX BQ900

3 Safety Considerations

3.1 For Integrators

- ! Only the approved antennas shall be used.
- ! No part shall be removed or modified on the module.
- ! The duty cycle must not exceed 28% for the module to be FCC approved.
- ! Please ensure that the environmental temperature is within the operating temperature.
- ! Please ensure that the voltage is within the operating limits.
- Frequency range is limited to 902.0875-927.9125.
- The power output is locked in the program and can not be altered.

3.2 Warnings



WARNING:
CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY ÅKERSTRÖMS BJÖRBO CORPORATION COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

CAUTION:

This device is approved as a mobile device with respect to RF exposure compliance. The antenna(s) used for this mobile transmitter must provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

3.3 Approved Antennas

Manufacturer proAnt:

Antenna 1: Ex-it GSM/868, RP-SMA straight angle.

Antenna 2: Ex-it GSM/868, RP-SMA right angle.

Antenna 3: Wire antenna 40 mm, AWG23, 0.6 mm diameter.

4 Operational Description

4.1 Operational Description

TRXBQ900 is a module transceiver used for remote control.

Power is supplied to the unit with external 3.5-5 V DC power.

The 3.3 V system DC voltage is supplied by an internal voltage regulator. The logic unit (CPU) is an 8 bit microcontroller from Microchip running at 19.68 MHz. The radio chip is a narrow band FSK (GFSK) transceiver. The radio protocol is a GFSK modulated signal with data speed of 9.6 kbits/s.

Data communication is made through the modules UART data interface. The data is processed by the CPU and clocked into the radio chip as a single data packet. The data consists of maximum 320 bits and is transmitted at a rate of 9.6 kbit/s. There is also an SPI interface where the user can select frequency and other parameters. For more info on the SPI interface see chapter 6.

The module can operate in two modes, Receive mode and Transmit mode. Normally the module is in Receive mode. When the first byte of serial data is received in the UART RX buffer, the module will shift to Transmit mode. When all received bytes in the RX buffer have been transmitted, the module will return to Receive mode.

The transfer rate to the RX buffer is 19200bps. In Receive mode the data bytes received will be transmitted on the TX-pin with 19200bps. Since the transmission rate over air is 9600bps there will be an idle time between received bytes. The data format is 9600bps, 1 stopbit, parity none.

4.2 Block Diagram

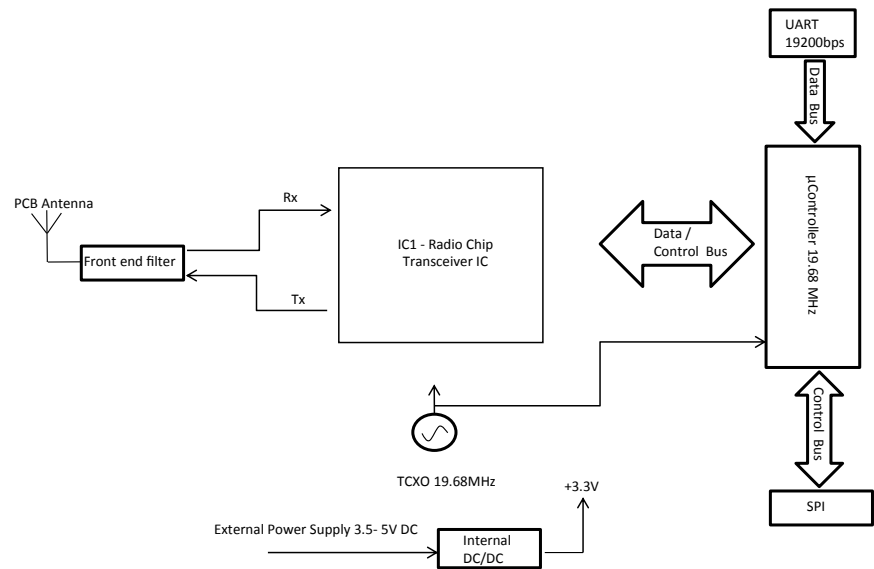


Figure 1. Overview block diagram

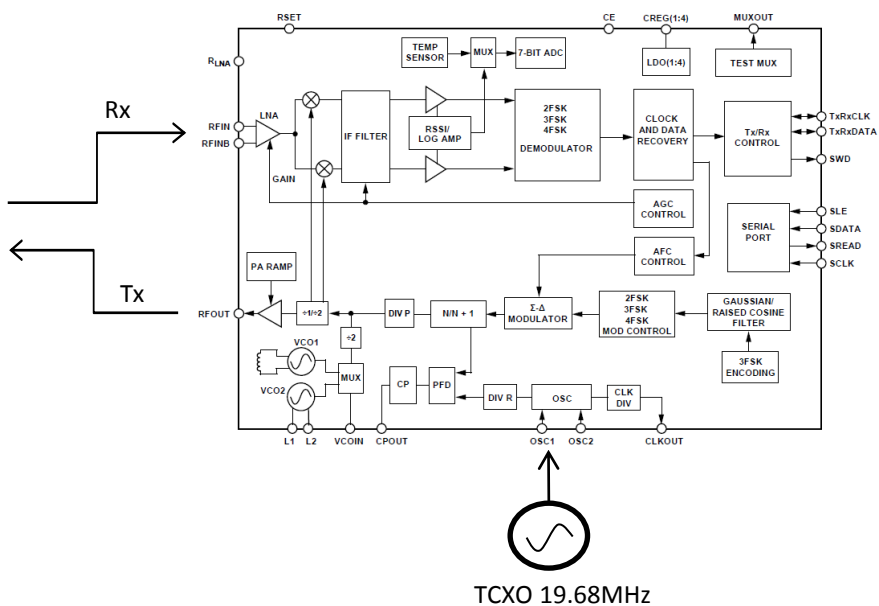


Figure 2. Diagram IC1 Radio Chip (enlarge)

5 PIN Information

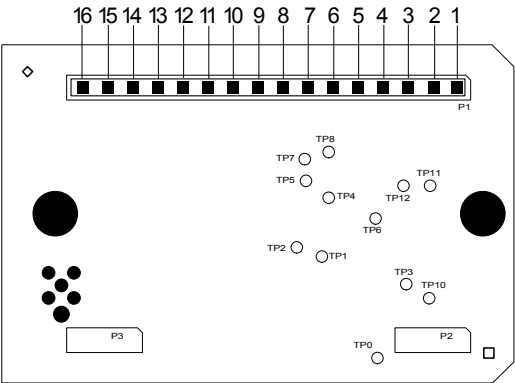


Figure 3. Pin numbers for P1 (solder side)

Connector P1-A			Connector P2		
Pin 1	VIN	VDD	Pin 1	-	
Pin 2	SDI	SPI DATA IN	Pin 2	GND	Ground (0V)
Pin 3	SDO	SPI DATA OUT	Pin 3	-	
Pin 4	SS	SPI SLAVE SELECT	Connector P3		
Pin 5	SCL	SPI CLOCK	Pin 1	-	
Pin 6	TX	UART TRANSMIT	Pin 2	GND	Ground (0V)
Pin 7	RX	UART RECEIVE	Pin 3	-	
Pin 8		SPARE INPUT	Note! Connector P2 and P3 is primarily used as stability legs and may be left disconnected.		
Pin 9	I/O	A INPUT/OUTPUT			
Pin 10	GND	Ground (0V)			
Connector P1-B					
Pin 11	VIN	VDD			
Pin 12	-				
Pin 13	VPP	PROGRAM VOLTAGE			
Pin 14	PGD	PROGRAM DATA			
Pin 15	PGC	PROGRAM CLOCK			
Pin 16	GND	Ground (0V)			

6 Adjustment via SPI

Through the SPI parameters can be set and read. Four bytes of data can be written and four bytes be read.

To module (SPI Slave) send (From Master)

Byte 0	Start byte 0x54
Byte 1	Dummy byte 0x00
Byte 2	Frequency bank number 0-15
Byte 3	Frequency channel number 0-29
Byte 4	Transmit power 0-100
Byte 5	Message type bit 0:RX =0 TX= 1 bit 1: short=0 long=1 bit 2: LBT ON =0 LBT OFF=1
Byte 6	Checksum XOR byte 0-6

Byte 2 and 3: Frequency settings

The module have 15 banks with 30 frequencies in each bank. By changing byte 2 and 3 the desired frequency can be selected.

Bank 0 and channel 0 correspond to the lowest frequency 902.0875 and bank 15 channel 29 correspond to the highest frequency 927.9125.

Byte 4: Transmit power

Transmit power 100 is maximum allowed power according to FCC regulations. 0 is output power off.

Byte 5: Message type

Bit 0-1: selects the size of the expected received packet.

Bit 2: selects if LBT (Listen Before Talk) is used or not.

From module (SPI Slave) (To Master)

Byte 0	Start byte 0x54
Byte 1	Spare byte
Byte 2	Channel +LBT. If channel blocked channel number+128
Byte 3	Spare byte
Byte 4	RSSI
Byte 5	Checksum XOR byte 0-5
Byte 6	Dummy byte 0x55

Byte 2: Channel + LBT

The selected channel number is returned. If the module is in Tx mode and LBT is active and the channel is occupied, the number is increased with 128.

Byte 4: RSSI

The RSSI value in -dBm is returned.

7 Duty Cycle

The duty cycle must not exceed 28% for the module to be FCC approved.

8 Label

The FCC ID label must be placed on the radio module.



Figure 4. Label for the radio module

Note! The device that contains the radio module have to be marked on the outside with “Contains Transmitter Module FCC ID: OG4-TRXBQ900” or “Contains FCC ID: OG4-TRXBQ900”.

The device shall also bear the following statement in a conspicuous location on the device together with the FCC ID:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



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