



RADIOMODEM

BK92N3HP

TRANSCEIVER

DATA SHEET

GENERAL DESCRIPTION

The BK92N3HP Radiomodem is a compact NB-FM wireless data transceiver module, based on Wireless M-Bus, to be employed on the 169MHz License free ISM Band.

The BK92N3HP operates on the 169MHz Band and is designed around the ADF7021N High Performance Narrow-Band Transceiver IC from Analog Devices.

A 32-bit microcontroller from Renesas (R5F100BFANA) is employed to implement the most advanced communication protocol with the best performance/consumption ratio for battery operated systems.

The BK92N3HP is optimised for quarter wave shortened helical antennas.

Depending on the antenna performance and obstacles this version offer the maximum long range operation (up to several kilometers).

RADIO MODEM SERIES 9 169MHZ

Version availability:

169 MHz SRD Band – 500 mW

Frequency	Power (mW)	Antenna	Manufacturer Code
169 MHz	10 - 500 mW	Without Antenna	BK92N3HP-xx

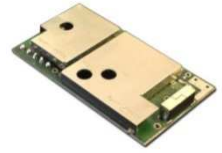
Field of Applications

- Telemetry
- Asset Tracking and Tracing
- Social Alarms
- Meter Reading
- Wireless M-Bus

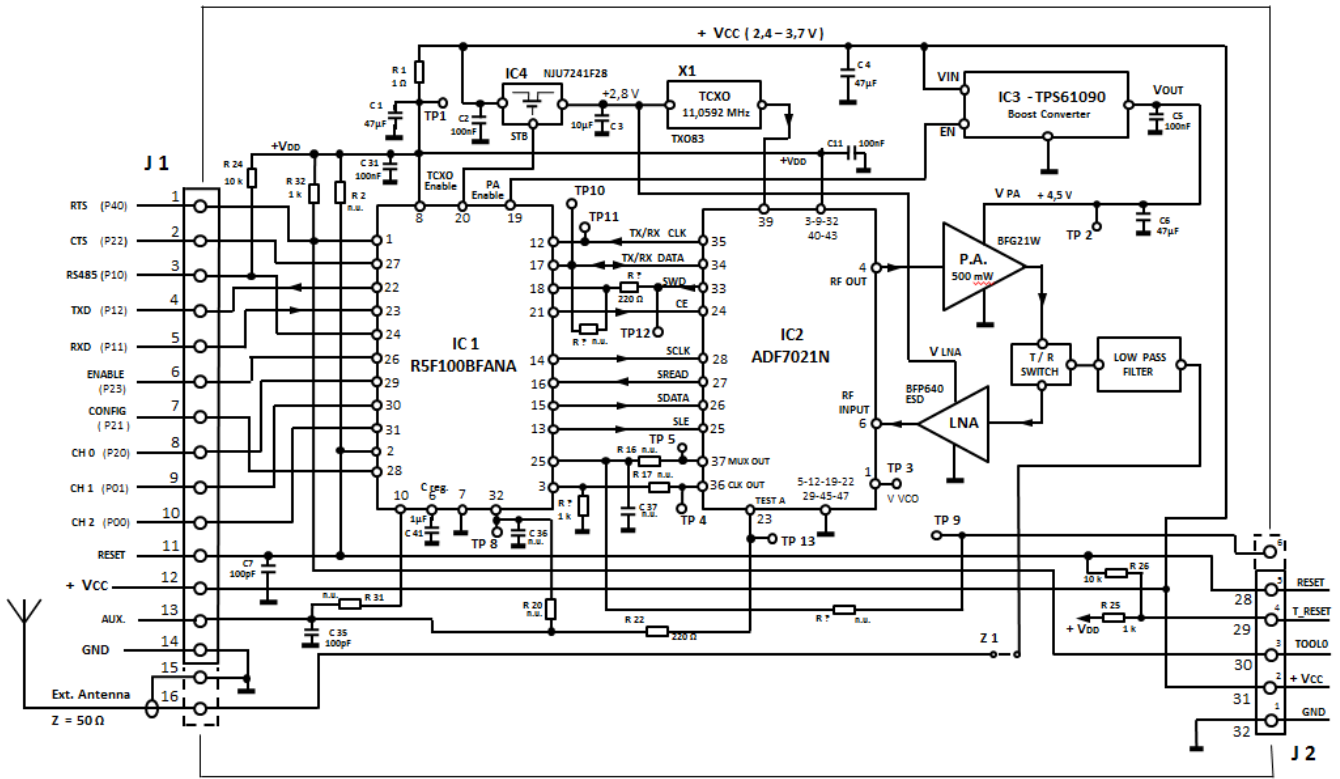


Circuit description

BK92N3HP is designed around ADF7021N RF transceiver from Analog Devices. The microcontroller is a low-power R5F100BFANA from Renesas. Detailed circuit description is shown in the diagram below.

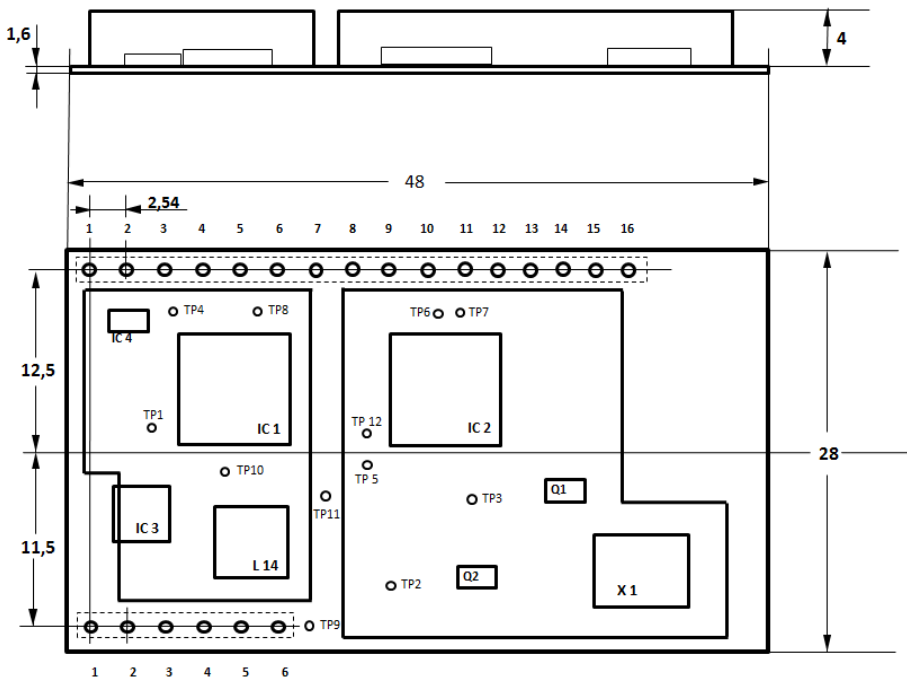


Block Diagram



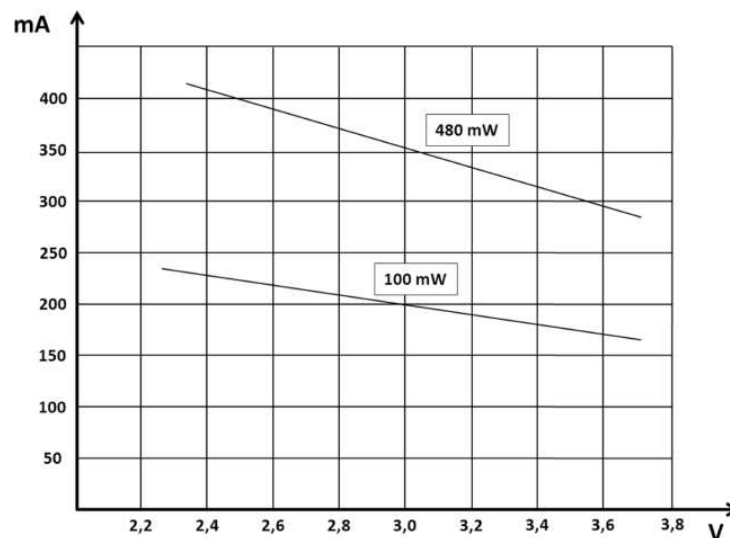
Mechanical Dimensions

All distances are in mm



SPECIFICATIONS

PARAMETER	VALUE	NOTES
Frequency	169.400 – 169.8125 MHz	ERC REC 70-03 – Annex 2 (169.400-169.475 MHz)
RF Power (conducted)	500 mW max.	@ V _{CC} =2.6V min. – 3.7V max.
Current consumption	Rx: 35mA	
	Tx: 330mA @ RF power = 480mW	@ V _{CC} = 3.3V _{DC} . See also graph below.
	Tx: 190mA @ RF power = 100mW	@ V _{CC} = 3.3V _{DC} . See also graph below.
Sleep current	Max. 5µA	Enable (J1 pin 6) = Low
Modulation	NBFM	
Channel separation	12.5 kHz	
Rx sensitivity	-120 dBm	BER Limit 10E2 (Data rate = 2kbps)
Rx selectivity	9 KHz	
Data Rate	1 – 10 kbps	GFSK Modulation
Power Supply	3.3 VDC (2.4Vmin – 3.7Vmax)	
Operating Temperature	-40°C to +85°C	
TCXO Frequency	16.8 MHz	Freq. stability ±2.5 ppm -25°C to +60°C
Microcontroller Flash ROM	96 KB	
Microcontroller Data Flash	8 KB	
Microcontroller RAM	8 KB	



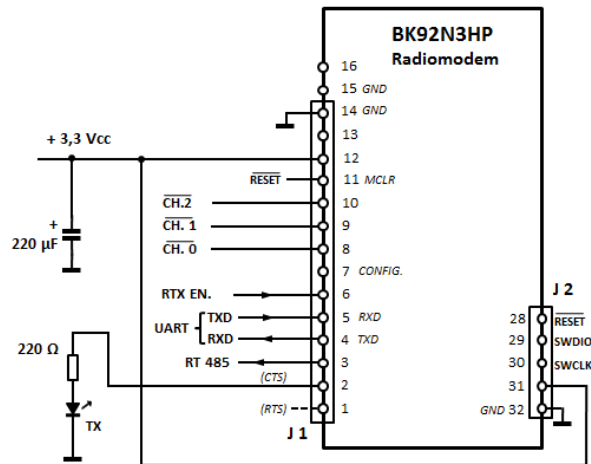
Tx CURRENT CONSUMPTION Vs SUPPLY VOLTAGE

ABSOLUTE MAXIMUM RATINGS

Values listed in the table below shall not be exceeded under any circumstance. Stress exceeding one or more of the parameters below may cause permanent damage to the device.

PARAMETER	VALUE	NOTES
Input Voltage	Typ. 3.3 V _{DC} (Min. 2.4V _{DC} – Max.3.7V _{DC})	
Operating Temperature	-40°C to +85°C	
Input RF power	Max. 10dBm	

EXTERNAL INTERFACES



PIN DESCRIPTION

N°	Pin name	Description	N°	Pin name	Description
1	RTS	UART RTS / ISP Programming	12	+VCC	Power supply
2	CTS	UART CTS	13	AUX	Aux. output (RSSI)
3	RS485	RS485 pin enable	14	GND	Ground
4	TXD	UART TX Data	15	RF GND	RF Ground
5	RXD	UART RX Data	16	ANTENNA	Connection from/to RF antenna
6	ENABLE	Enable / Power Save	28	RESET	Reset from JTAG
7	CONFIG	Enables configuration mode	29	T_RESET	Currently not used
8	CH0	Output power selection	30	TOOL0	Currently not used
9	CH1	Frequency channel selection	31	+VCC	Power supply
10	CH2	Frequency channel selection	32	GND	Ground
11	RESET	Microcontroller reset			

Wireless M-Bus Protocol

Wireless M-Bus is a European standard (EN 13757-3, EN 13757-4) for the remote reading of gas or electricity meters, also usable for the reading of other types of consumption meters. Wireless M-Bus defines a common interface for Meters and Collectors, so that devices produced by different companies are able to communicate with each other.

There are several Wireless M-Bus functioning modes, each one having different frequency band, baud rate, communication mode and logic. BK92N3HP uses Mode N, which is optimized for narrowband long range devices. In mode N data is NRZ-encoded; communication can be either one-way or bidirectional.

Wireless M-Bus Mode N characteristics:

Parameter	Min.	Typ.	Max.	Unit
Frequency band	169.400		169.475	MHz
Channel spacing		12.5 / 25 / 50		kHz
Transmitter duty cycle			10	%

Wireless M-Bus protocol is implemented in BK9xx series radio modems as follows: data to be transmitted is sent to UART Rx input and buffered into the MCU. The data packet is then assembled with Preamble, Syncword, Frame Length and sent to ADF7021 transceiver to be transmitted on RF.

RF Received data is demodulated by ADF7021, checked for correct CRC and then the data packet is sent to the UART TX output.

The Embedded M-Bus protocol is used to transmit and receive data packets based on dedicated application messages from an external device (Meter or Concentrator). Configuration parameters such as source address and destination address are stored in non-volatile memory either through serial interface or asserting the CONFIG pin.

The Radiomodem can enter Sleep mode to reduce power consumption .

Optionally, on the basis of customer requirements, additional M-Bus application layers can be integrated into the Application option block, for instance:

- Non-volatile Memory for storing meter data
- Frame Filtering (ID Filtering)
- AES-128 encryption
- Auxiliary input/output pins
- Alarms – tamper detection
- Analogue ADC input

BK9 Wireless M-Bus implementation block diagram:

