

## HYBRID RADIO RECEIVER NHRX401

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### FEATURES

- 433.92MHz operating frequency
- Support data transmission rates up to 115.2 kbps without Manchester coding
- Transmission range up to 100m in open ground and up to 15m in-building
- 3.3V or 5.0V power supply voltage
- Low power consumption
  - o 5 mA @ 3.3V
  - o 8 mA @ 5.0 V
- Evaluation board available
- Trough hole and SMD mounting available



### APPLICATIONS

- Wireless communication/control systems
- Radio modems for PC
- Short range radio communications system
- Alarm systems

### GENERAL DESCRIPTION

NHRX401 is a low-power hybrid radio receiver designed for short-range wireless control and serial data communication system with the data transmission rate up to 115.2kbps. The NHRX401 operates at 433.9MHz with Amplitude-Shift Keyed (ASK) modulated signal. The NHRX401 is compatible with NHTX401 radio transmitter.

### ORDERING INFORMATION

PART	VCC SUPPLY VOLTAGE	MOUNTING
NHRX401-3.3V-D	from 3.0V to 4.0V,	trough hole
NHRX401-3.3V-S	from 3.0V to 4.0V,	SMD
NHRX401-5.0V-D	from 4.5V to 6.0V,	trough hole
NHRX401-5.0V-S	from 4.5V to 6.0V,	SMD

## HYBRID RADIO RECEIVER NHRX401

### PIN CONFIGURATION AND DIMENSIONS

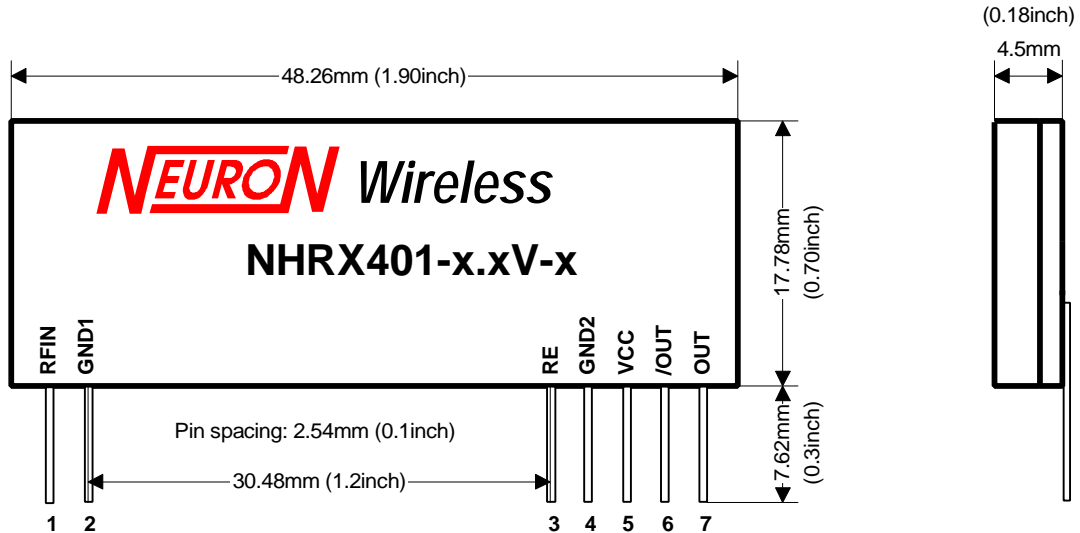


Figure 1. NHRX401 pin configuration

### ABSOLUTE MAXIMUM RATINGS

Rating	Value	Units
Power Supply Voltage (VCC to GND2)	-0.3 to +6.0	V
Receive Enable Signal (RE to GND2)	-0.3 to VCC+0.3	V
Storage temperature	-50 to +85	?C
Storage Humidity	85% non condensing	
Operating temperature	-40 to +85	?C
Lead temperature (soldering 7 sec)	260	?C

## HYBRID RADIO RECEIVER NHRX401

### ELECTRICAL CHARACTERISTICS

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Frequency		433.72		434.12	MHz
Modulation type		ASK			
Data rate		9.6		115.2	kbps
Minimum output signal pulse		8.6			?S
Maximum output signal pulse				416.6	
Receiver performance					
Input signal Rejection, 30MHz	for 10 <sup>-4</sup> BER and 25°C		-85		dBm
		55			dB
Supply voltage (VCC to GND2)	NHRX401-3.3V	3.0	3.3	4.0	V
	NHRX401-5.0V	4.5	5.0	6.0	
Supply current	VCC=3.3V; RE=3.3V NHRX401-3.3V	4.7		5.0	mA
	VCC=3.3V; RE=0V NHRX401-3.3V		4.5		
	VCC=5.0V; RE=5.0V NHRX401-5.0V	7.2		7.4	
	VCC=5.0V; RE=0V NHRX401-5.0V		6.8		
RE low-level input voltage	NHRX401-3.3V, VCC=3.3V NHRX401-5.0V, VCC=5.0V	-0.3	-	0.8	V
RE high-level input voltage	NHRX401-3.3V, VCC=3.3V NHRX401-5.0V, VCC=5.0V	1.8 2.0	- -	VCC VCC	
OUT ( $\overline{\text{OUT}}$ ) output voltage high	NHRX401-3.3V, VCC=3.3V NHRX401-5.0V, VCC=5.0V			3.5 5.0	
OUT ( $\overline{\text{OUT}}$ ) output voltage low				0.1	
Operating ambient temperature		-10		+70	
Receive disable to enable switch time	After 100ms disable receive		200		?s

Typical values at T = 25 °C

### TYPICAL OPERATING CHARACTERISTICS

Typical operating characteristics will be prepared.

### ELECTROSTATIC DISCHARGE SENSITIVITY

Electrostatic discharge can cause damage ranging from subtle performance degradation to complete device failure. It is highly recommended that all modules be handled and stored using appropriate ESD protection methods.

## HYBRID RADIO RECEIVER NHRX401

### NHRX401 BLOCK DIAGRAM

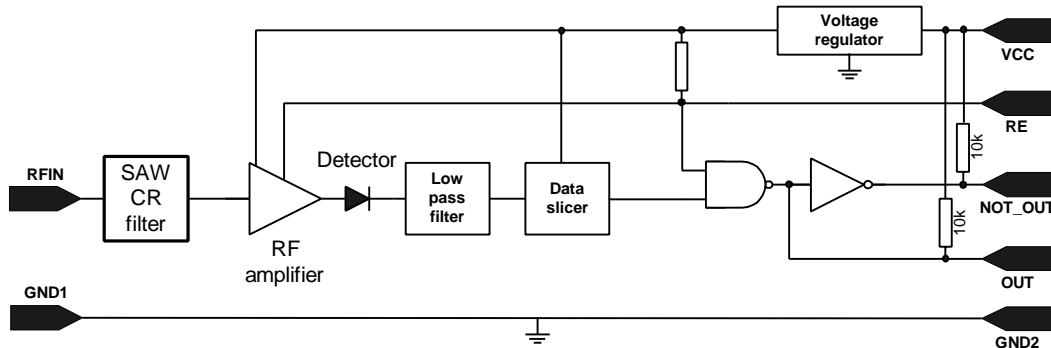


Figure 2. NHRX401 block diagram

### PIN DESCRIPTION

PIN	NAME	DESCRIPTION
1	<b>RFIN</b>	RF input pin from antenna. This pin is internal DC connected to GND1 for ESD protection (see antenna section for more information)
2	<b>GND1</b>	GND1 is a receiver RF ground pin. This pin should be connected to ground plane for antenna.
3	<b>RE</b>	Receive Enable pin may be used to enable/disable receiving. RE is a high-impedance input (CMOS compatible) with internal pull-up to 3.3V. An input low voltage is disabling receiving. High input level enable receiving. This pin can be left unconnected.
4	<b>GND2</b>	GND2 is a power ground pin. GND2 is internally connected with GND1 and electromagnetic screen.
5	<b>VCC</b>	VCC is a positive supply voltage pin. For more information see electrical characteristic section.
6	<b><math>\overline{\text{OUT}}</math></b>	This pin is a receiver data output. The output data is negative data i.e. as fed to the transmitter. $\overline{\text{OUT}}$ pin is internally pull-up via 10k $\Omega$ resistor to VCC pin. Logic levels are compatible with CMOS gate.
7	<b>OUT</b>	This pin is a receiver data output. The output data is true data, i.e. as fed to the transmitter. OUT pin is internally pull-up via 10k $\Omega$ resistor to VCC pin. Logic levels are compatible with CMOS gate.

## HYBRID RADIO RECEIVER NHRX401

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### *DETAILED DESCRIPTION*

The NHRX401 is a hybrid radio module designed to short-range wireless communication systems. The NHRX401 works with Amplitude-Shift Keyed modulation at 433.92MHz with serial data transfer up to 115.2kbps. The NHRX401 bases on unique amplifier-sequenced architecture and two stages SAW filtering to achieve excellent out-of-band rejection. The NHRX401 is available in the two power supply versions: NHRX401-3.3V with supply voltage VCC=3.3V and NHRX401-5.0V with supply voltage VCC=5.0V.

The NHRX401 have two digital data output that can direct drive any external CMOS gate or Microcontroller input port and receive enable (RE) digital input compatible with the CMOS input.

### *ANTENNAS*

The RFIN pin is internal DC connect to GND1 for ESD protection. For the best receiving conditions a whip antenna is recommended. Optimum total length from pin RFIN to end whip antenna is 17.2mm (1 wavelength). The receiving parameters depend on PCB mounting, antenna positions and presence of the other metal part in the system. The different antenna types can be used; i.e. helical antenna, loop antenna or SMD chip antenna but whip 1 wavelength is most recommended.

### *DATA RECEIVING*

The NHRX401 hybrid is full compatible with NHTX401 transmitter that can directly work with RS-232 signal. The maximum data rate is equal 115200bps without any Manchester coding or any other similar process changing mark to space ratio. So the minimal time between next receiving edge can be 8.6?s (i.e. one bit for 115.2kbps data rate). Maximum time between next receiving edge can be 156.25?s (i.e. nine bits for 57.6kbps data rate). For more information about data transmission format see NHTX401 data sheet.

For enable receive pin RE must be set to high voltage level or left disconnected (pin RE have internal pull-up resistor to 3.3V). This RE state enables RF amplifier and digital data outputs. After the receive enabling, receiver is ready to get a new data byte within 200 ?s, i.e. less than half of the time necessary to collect all bits from the incoming byte.

When RE state is at the low-level, RF amplifier is disabled and data output is set to 0V ( $\overline{\text{OUT}}$  is set to VCC). Data OUT pins are full compatible with the CMOS gate output and are internal 10k? pull-up to VCC pin.

## HYBRID RADIO RECEIVER NHRX401

### TYPICAL OPERATING CIRCUIT

The NHRX401 can be directly connected to any PC computer RS-232 port (see figure 3) or to the serial port in any Microcontroller (see figure 4).

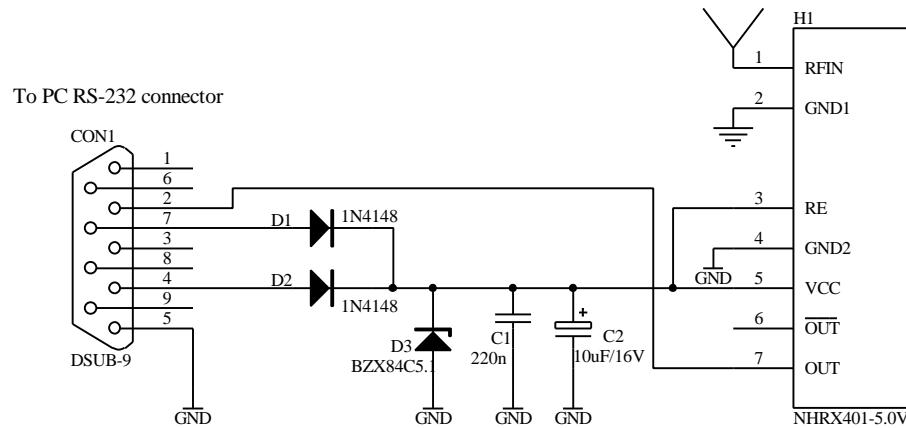


Figure 3. Direct connection NHRX401 to PC computer RS-232 port

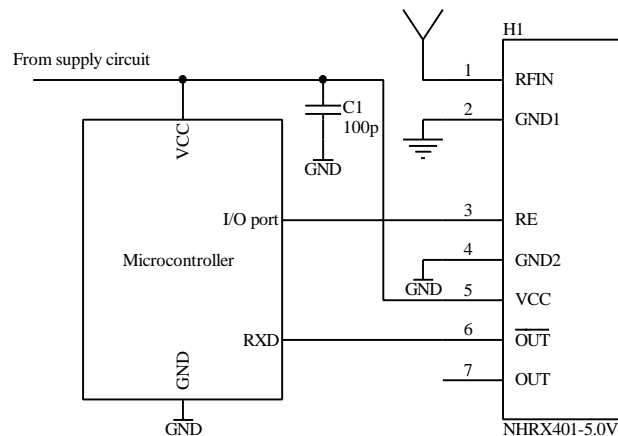


Figure 4. Direct connection NHRX401 to Microcontroller

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### PCB AND MOUNTING CONSIDERATIONS

The NHRX401 module can be mounted horizontally or vertically on area of ground plane preferably close to the antenna. Perpendicular to PCB plane mounting demands additional support for receiver to avoid pins leaning. Antenna should be kept away from any sources of interference. The NHRX401 is trough hole (NHRX401-xxV-D) mounting and SMD (NHRX401-xxV-S) mounting available.

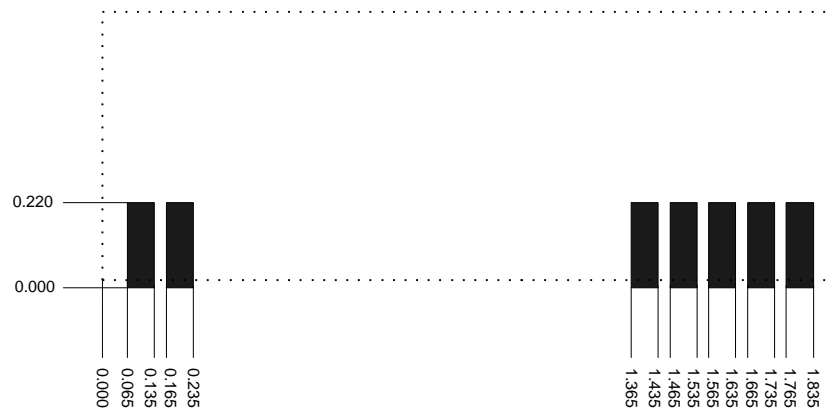


Figure 5. Foot prints for SMD mounting version (all dimensions in inch)

### NHRX401 EVALUATION KIT

The NHXX401-EVAL evaluation kit is fully assembled and tested transceiver circuit with NHRX401 receiver and NHTX401 transmitter. It is delivered common with software running under Windows® environment. See separate data sheet NHXX401.pdf.

### SUPPORT

More recent information about NHRX401 receiver is available by using any internet browser attached to [www.neuron-ltd.com/wireless](http://www.neuron-ltd.com/wireless).

We also provide customer support by e-mail: [wireless@neuron.com.pl](mailto:wireless@neuron.com.pl).

### DOCUMENT VERSION

This document is a version 1.0 of the data sheet.

The document date is December 2000.

This document replaces the NHRX401-SEPT2000 document and all previous.

For more recent data sheet as well application notes see at [www.neuron-ltd.com/wireless](http://www.neuron-ltd.com/wireless)

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