CIRCUIT DESIGN, INC.

CDP-RX-03AS

CDP-RX-03AS
UHF FM-NARROW BAND RADIO DATA RECEIVER

Operation Guide
Version 2.0 (February 2001)

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GENERAL DESCRIPTION & FEATURES

Features

- 868-870 MHz & 433-434MHz UHF band. Compatible with European EN 300 220 standard
- Very small compact integrated device with robust metal housing
- FM narrow band modulation and high frequency stability
- Low current consumption, ideal for mobile application
- Control terminal for switching the power on/off

Applications

- Remote control system
- Telemetry system
- Social alarm system
- Security alarm system
- Paging system

General description

The CDP-RX-03AS UHF FM-narrow band receiver is developed to cover a band plan of ERC Recommendation on Short Range Device (SRD) in the range of 868-870MHz and 433-434MHz ISM band. The receiver design is based on the double Super-heterodyne principle with PLL control enabling high signal sensitivity, high selectivity, and high frequency stability not achieved by simple SAW resonator receivers or other low cost designs.

Extensive filtering by an integrated unique SAW filter element enables operation in hazardous areas where interference may be expected. Steadily increasing use of the available frequency spectrum demands the application of narrow band systems for maximum operation reliability and fairness to other users of the ISM band.

The CDP-RX-03AS receiver module is designed to match the CDP-TX-03S and the CDP-TX-04S transmitter modules, though signals from other FM-narrow transmitters can be received as well.

The receiver frequency must match with the transmitter frequency to enable reception. The CDP-RX-03AS is designed for PCB mounting. A simple wire can be soldered to the antenna input or the antenna can be printed on the PC board. Antenna of impedance matching with each frequency should be used.

The receiver module has AF, DATA and RSSI signal out puts, and one control pin.

OPERATION INSTRUCTIONS

Please read these instructions before you start using the CDP-RX-03AS.

The CDP-RX-03AS is designed as a module that will be integrated into a user system. It is not a ready-made product for private users. It can be regarded more like a special component for part of an electronic system. The user needs basic knowledge about electronics. Special knowledge about RF technology is helpful, but the most difficult parts are integrated into the modules to enable easy operation. Some additional information is given here:

Supply voltage:

The CDP-RX-03AS receiver module contains a voltage regulator to guarantee stable performance in the given range of supply voltage.

The design was made for operation with a battery. Supply voltage must be used within specified voltage. The module shows unstable function with the voltage lower than specified. If the voltage which connected to the Vcc (+) and Ground (-) terminal is beyond the maximum voltage given in the technical specification or reversed, the module will be permanently damaged. To enable a low minimum voltage, no internal circuit is used to prevent damage by incorrect polarity.

If a higher supply voltage is available then a simple diode can be inserted in connection line to the Vcc terminal to prevent damage by incorrect polarity. The diode must be rated for the maximum supply current detailed in the technical specifications.

Data format:

Long intervals of HIGH or LOW bits should be avoided. Succeeding bits can be distorted in their pulse width. If the sequence of HIGH or LOW bits is too long then there is possibility that the logic level of the data output will change. The maximum pulse width for continuous High and Low signal is 20msec (96bit) at 4800bps. The minimum pulse width is 208 us. Maximum data rate is 4800bps.

It will be very helpful to have a 20 bits preamble (1010…) in front of the data to ensure communication reliability.

In general, at higher data rates (4800 Baud) the internal signal is shaped into a slope and jitter at the receiver data output increases.

Further advice can be given if the precise format of the data and system requirement is notified to the dealer or directly to Circuit Design, Inc. Your inquiries and comments are welcome .

Outputs:

At the receiver side 3 output (AF, DATA and RSSI) signals and one control terminal are available.

AF output is the analog output from the FM detector circuit.

The DATA output is a digital output. This is the signal after AF signal pass through band pass

filter and comparator. For simple FSK modulation of digital data, the DATA out terminal can be used. The signal can be easily connected to other digital circuits.

The receiver has no internal mute circuit to avoid delays and achieve maximum sensitivity. The AF and DATA output will show noise on the output when no signal is received. Valid data signals can be detected by utilizing the RSSI output.

The third output is called RSSI. It is an indicator of the received signal strength. It can be used to drive an external mute circuit.

Control terminal can be used to control Vcc supply for internal circuit.

Antennas:

Most important for effective data transmission is selection of a good antenna, and RF grounding, both for the transmitter and the receiver. Without an antenna it is impossible to transmit data over a long distance range.

The receiver has a simple antenna input pin. Any suitable UHF antenna can be connected to it. The easiest way to connect an antenna to the CDP-RX-03AS is to solder an 8.6cm (868MHz) or 17.3cm (434MHz) wire directly to the antenna input. If the receiving antenna is installed away from the receiver module, a 50-Ohm Coax antenna wire can be used. The shielding of the antenna wire should be soldered to the case near the antenna input of the CDP-RX-03AS.

It is possible, but not recommended to connect the receiver module and the antenna by a connection on a PCB. This will decrease the receiver performance in most cases.

In most cases the following basic rules will help you.

- Connect an antenna with 50-Ohm impedance.
- Lambda/4 whip antenna length is approximately 17.3cm for 434MHz and 8.6cm for 868Mhz.
- Place the antenna vertically, straight up or down from the transmitter and receiver module.
- Do not cover the antenna with metal parts.
- The connection of the metal surface of the transmitter case to a larger metal part (ground plane) will increase radiation efficiency. Such metal part should not be placed near the antenna.
- The human body can have similar effects like metal objects. Pocket transmitters should be taken in the hand and put in a position away from the body and pointed in the direction of the receiver.
- Best range is achieved if the transmitter and receiver antenna have a direct visual connection. Any object in between the transmitter and receiver antenna, and metallic objects in particular, will decrease the range.
- The transmission is influenced by reflections of the transmitter signal on metallic surfaces and building. There is possibility to have data error by overlaying the direct and reflected signal.
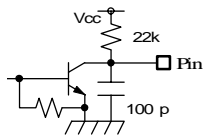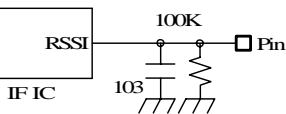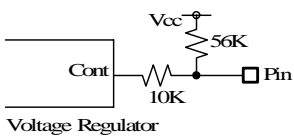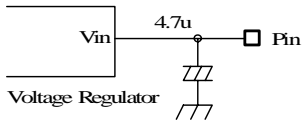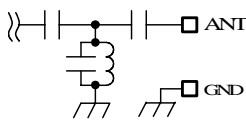
SPECIFICATIONS

RECEIVER: CDP-RX-03AS

|	
RECEIVER TYPE	Double Superheterodyne, PLL Controlled Fixed channel
FREQUENCIES	Fixed channel 433.920, 434.075, 868.3, 869.2625, 869.75MHz
FREQUENCY STABILITY	+/- 2.5kHz (-10 to +55 C) / 434MHz
	+/- 3.0kHz (-10 to +55C) / 868MHz
PULSE WIDTH	Min. 208uS Max.20mS
DATA RATE	100-4800bps FSK
SENSITIVITY	-120 dBm / 434MHz (12dB/SINAD, CCITT filter)
	-117 dBm / 868MHz (12dB/SINAD, CCITT filter)
SELECTIVITY	+/-5 KHz at -6 dB point
DEMODULATION	FM narrow
DISTORTION	<5% at 1 KHz (AF output)
S/N RATIO	50 dB overall (AF output)
DATA OUTPUT	Digital output, pulled up to Vcc (22 kohm)
OTHER OUTPUT	RSSI, AF (-11 dBm typ. at Fm=1kHz /Fmod=+/-3kHz , 100kohm)
SUPPLY VOLTAGE	3.0 to 14V DC
SUPPLY CURRENT	18 mA (Typ.)
I/O TERMINALS	Ant, Gnd, Vcc, Data out, AF out, RSSI out, Power Control
SIZE & WEIGHT	36 x 26 x 8 mm (7.5cc), 12g

Note: Above specifications are subject to change for improvement without prior notice.

PIN DESCRIPTION

| Pin-No.	Pin-Name	I/O	Description	Equivalent internal circuit
CN1-1	DATA	O	The data signal output The terminal is pulled up with resister	
CN1-2	AF	O	The AF signal output terminal The signal output level is –11dBm typ. (Fm=1KHz /Fmod=+/-3KHz, 100Kohm)	
CN1-3	RSSI	O	The receiving level output The level indicate the strength of RF level	
CN1-4	CTRL	I	The power on/off control terminal. (Lo active) The voltage which Vcc-1.8V or lower voltage make the circuit active.	
CN1-5	VCC	-	The power supply terminal Operates on 3.0 to 14V	
CN1-6	GND	-	The ground Connect to the ground of the control board.	
CN2-1	ANT	I	The antenna terminal Connect the antenna with 50 ohm impedance	
CN2-1	GND	-	The ground terminal for the antenna	

BLOCK DIAGRAM
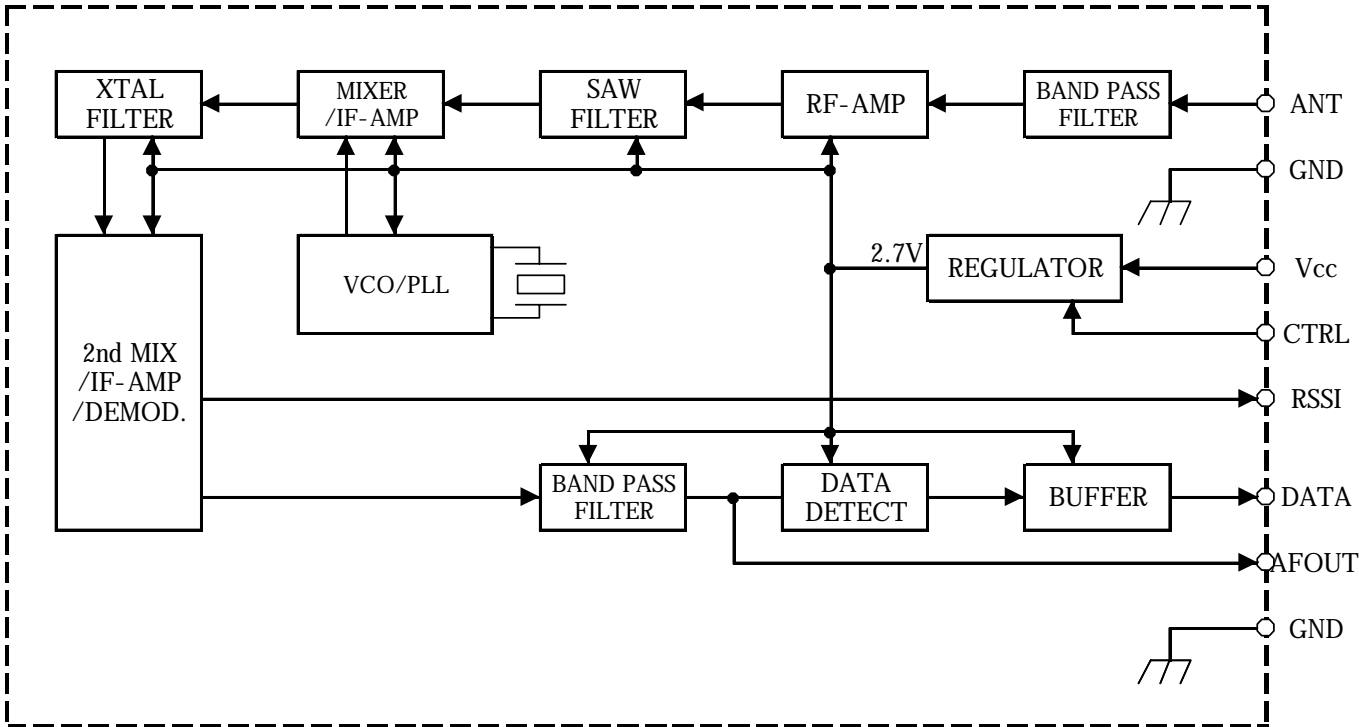
DIMENSIONS
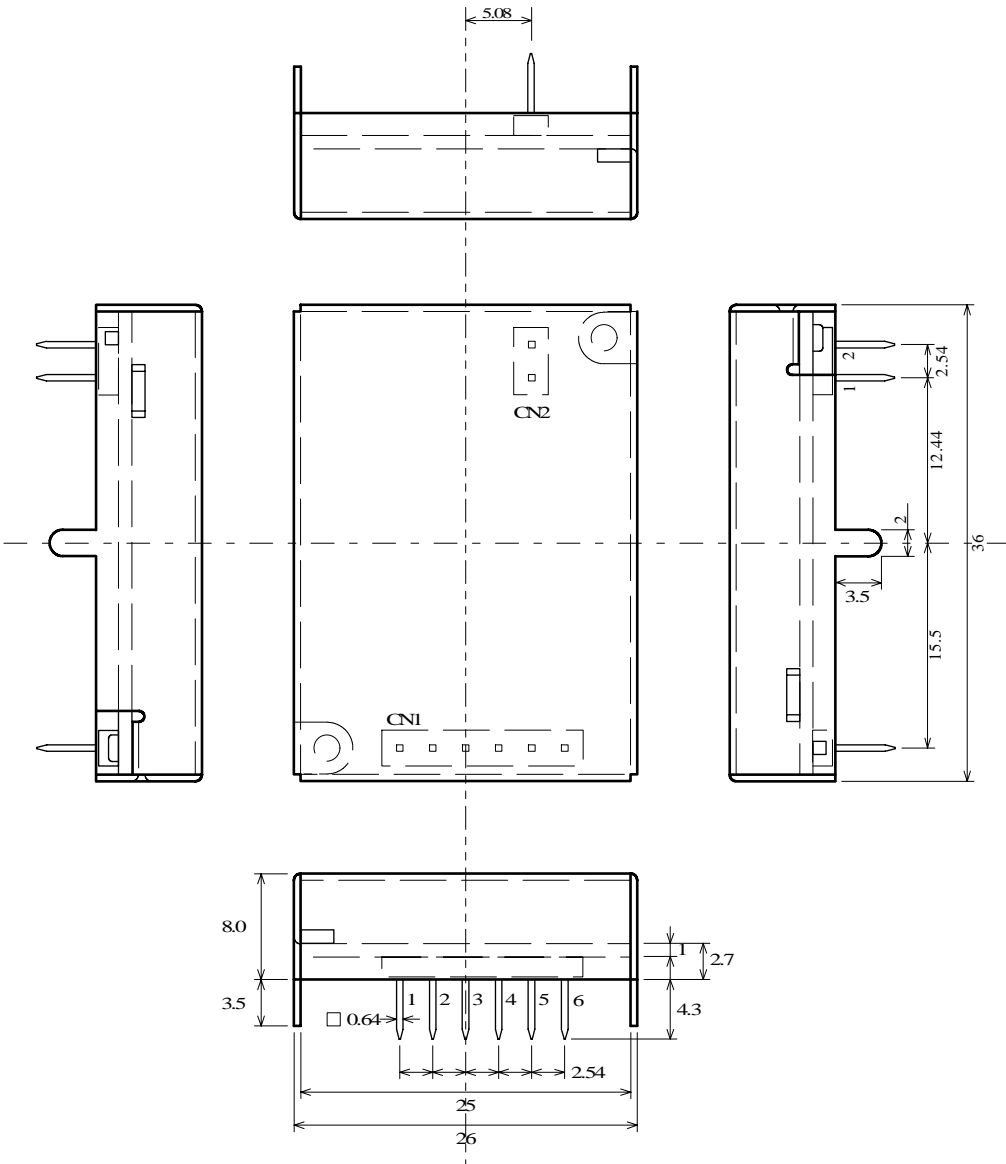
PIN CONECTION

CN1- 1: DATA
2: AF
3: RSSI
4: CTRL
5: Vcc
6: GND

CN2- 1: ANT
2: GND

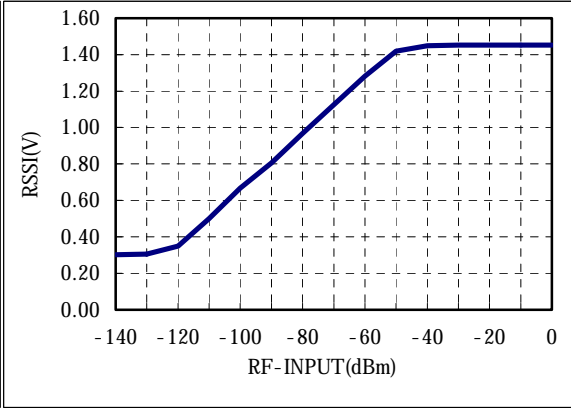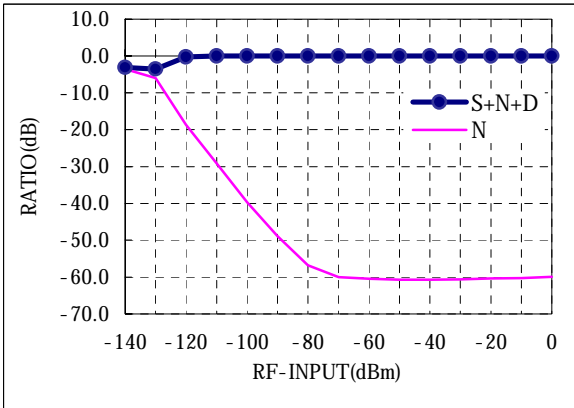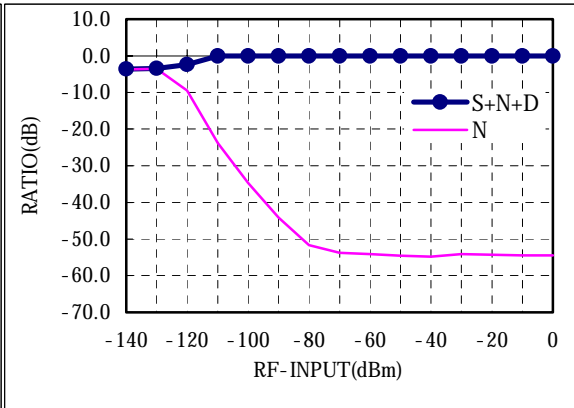# TEST DATA

RSSI (V)
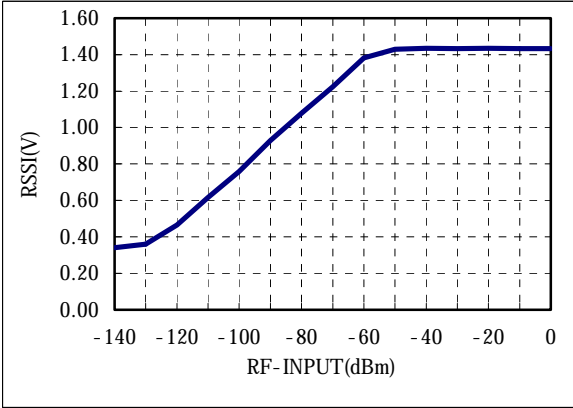
434MHz

868MHz

SIGNAL/NOISE RATIO (dB)

434MHz

868MHz