

**CIRCUIT DESIGN, INC.**

# CDP-TX-04S

**UHF FM-NARROW BAND RADIO DATA MODULE**



## *Operation Guide*

*Version 1.0 (July 2000)*

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## GENERAL DESCRIPTION & FEATURES

### Features

- Compliant with European EN 300 220 standard
- Remarkable miniaturization as FM narrow band module , 22 x 12 x 16mm
- FM narrow band modulation and high frequency stability
- Low current & voltage consumption, 22mA & 2.2-5V, ideal for mobile application
- Five standard frequencies
  - 433.920 & 434.075 in 434MHz band, 868.3, 869.2625 & 869.75MHz in 868MHz band
- Pin compatibility between 434MHz and 868Mhz provides efficient lineup
- Data rate 4800bps
- Fast start up time 5msec
- Higher performance is achieved in combination with the CDP-RX-03AS receiver

### Applications

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

### General description

The CDP-TX-04S and the CDP-RX-03AS\* are developed to cover the band plan of the ERC Recommendation on Short Range Device (SRD) in the range of 434MHz and 868MHz.

The CDP-TX-04S is a UHF FM-narrow band transmitter with PLL controlled oscillator for high frequency stability. This module utilizes advanced RF design technique and is suitable for various application fields such as wireless data communication, remote control, telemetry or wireless security systems. It is easy to use and integrate into such application systems.

Narrow band FM technique gives you the advantage of receiver sensitivity and the reliability for communication and allows efficient use (25KHz step) of the available RF spectrum.

The CDP-TX-04S has all these advantages and realized the compact size as small as SAW based RF module. The size of the CDP-TX-04S is reduced 80% of that of the CDP-TX-01.

5 ms after the transmitter is connected to a power source, 2.2-5.5 Volt digital input data can be transmitted in the specified frequency range without further control or synchronization.

For best performance in a user system, general rules of radio frequency technology should be taken into consideration.

\* Refer to 'CDP-RX-03AS operation manual' for further information

**Note:**

Frequency of the CDP-TX-04S may be set at specific frequency at the factory within the new European 868MHz band (868.00MHz to 870MHz). According to the valid national regulation following the European guide line of the Short Range Device CEPT ERC Recommendation 70-03, maximum duty cycle is defined from 0.1% up to 100% in each sub band within 868.00MHz-870MHz. The user must ensure that the transmission duration of the CDP-TX-04S does not exceed maximum duty cycle defined.

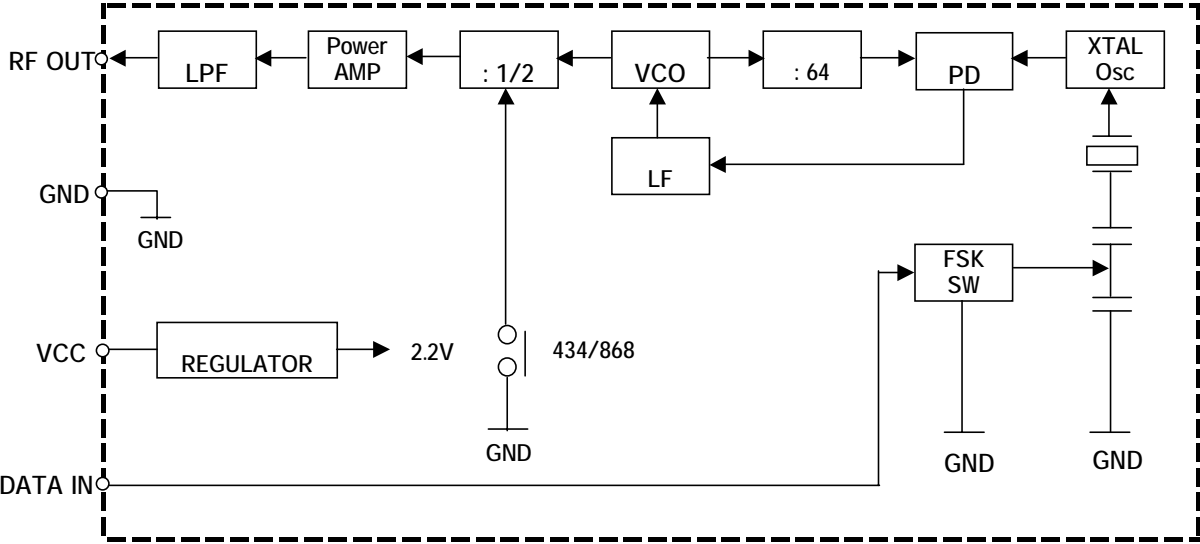
Make sure that the CDP-TX-04S is used within specified supply voltage (2.2-5V). Use out of the supply voltage may cause malfunction.

To fulfill the requirement of EMC, make sure that the CDP-TX-04S is mounted on your PCB and covered in the case of end product. Any surface of the module should not be exposed.

*Caution to the user who use the CDP-TX-04S in Germany*

The CDP-TX-04S emits un-modulated carrier when power is supplied. User must design surrounding circuit of the CDP-TX-04S to ensure that un-modulated carrier should not be emitted. It is defined in 3.3 of German regulation BAPT 222 ZV 125.

# BLOCK DIAGRAM



# PIN DESCRIPTION

Pin-No.	Pin-Name	I/O	Description
1	RFOUT	O	Z=50 ohm The RF output power is 10mW in 434MHz and 5mW in 868MHz. 1/4 lambda whip antenna is recommended. The antenna length is 17.3cm for 434MHz and 8.6cm for 868MHz.
2	GND	-	The ground. Please connect to the widest GND on the PCB.
3	VCC	-	The power supply terminal. Operates on DC 2.2V to 5.5V. If the voltage becomes lower than 2.2V, which will affect RF characteristics such as frequency stability.
4	DATAIN	I	The data input terminal. Digital input. Hi level = VCC Lo level = 0V Stable transmission will be obtained 5msec after VCC is fed to the terminal. The maximum time for continuous High or Low signals must be within 20msec. When this pin is open, the frequency has an offset drift. Once a standard code such as 511PNCODE has been inputted, the frequency will be within specifications.

## OPERATION INSTRUCTIONS

### **Please read these instructions before you start using the CDP-TX-04S.**

The CDP-TX-04S is designed as a module that will be integrated into a user system. This module is not a ready-made product for private users and can be regarded more like a special components for parts 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:

#### **VCC:**

The CDP-TX-04S contains a voltage regulator to guarantee stable performance in the given range of supply voltage. The design was made for operation with a battery. This module must be used with the voltage specified. The module shows unstable function with the voltage lower than specified

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 IN:**

The voltage of the data signal should be between 0V and Vcc. The data can be digital signal.

When High (Vcc level) is inputted in DATAIN, High will be outputted from DO of the CDP-RX-03AS , and when Low (GND level) is inputted, Low will be outputted.

***It is not necessary to synchronize the data signal of the transmitter, but the data signal should be fed to the transmitter 5ms after the transmitter power on.***

The maximum data rate is 4800bps. The maximum pulse width for continuous High and Low signals is 20msec (96bits) at 4800bps. The minimum pulse width is 208  $\mu$  s.

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

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.

**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.

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.

**Note:**

*If the modules will be installed to a control PCB (motherboard), this PCB must be designed as a RF PCB. The surface of the PCB must be shielded as much as possible. The modules should be kept away from the MC, EPROM and crystals.*

## SPECIFICATIONS

### 434MHz

General characteristics	
COMMUNICATION FORM	One Way
TRANSMITTER TYPE	FSK Modulation, PLL Controlled Fixed Channel.
FREQUENCIES	Fixed channel 433.920MHz/434.075MHz,
FREQUENCY STABILITY	< +/- 2.5KHz (-10 to 60 C)
PULSE WIDTH	Min. 208 uS Max.20mS
DATA RATE	100 - 4800 bps FSK
OPERATING TEMPERATURE	-10 C to + 60C
SUPPLY VOLTAGE	2.2 to 5.5V
SUPPLY CURRENT	22 mA (at 10mW/2.2V)
I/O TERMINALS	Vcc, Data In, Gnd, RF
SIZE & WEIGHT	22 x 12 x 6 mm, 3.4g
Electrical characteristics	
RF OUTPUT POWER	9mW +/-2mW
FREQUENCY STABILITY at 25 C	=<+/-0.5k
SPURIOUS EMISSION	< -50dBm (< 1GHz)
	< -46dBm (>=1GHz)
MODULATION	FM narrow
MODULATION POLARITY	Positive
INPUT SIGNAL	Digital
DATA INPUT LEVEL	Hi=VCC Lo=GND
DEVIATION	+/- 2.5KHz ± 0.5 (4800bps PN CODE)
FM MODULATION S/N	>= 40dB (LPF=20kHz)
ADJACENT CHANNEL POWER	200nW (4800bps PN CODE/CH=25k)
START UP TIME	5msec (Typ.)

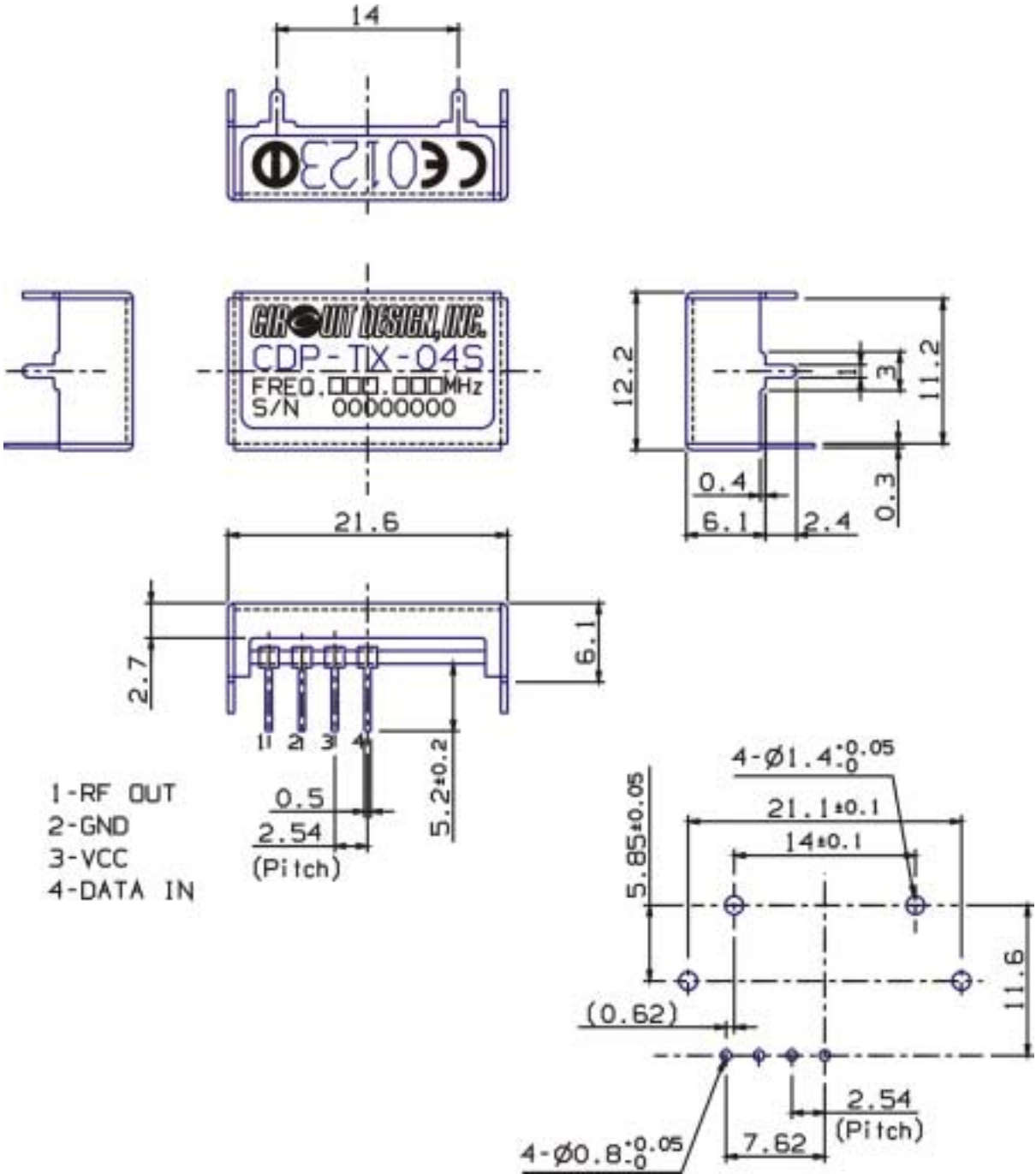
### 868MHz

General characteristics	
COMMUNICATION FORM	One Way
TRANSMITTER TYPE	FSK Modulation, PLL Controlled Fixed Channel.
FREQUENCIES	Fixed channel 868.30MHz/869.2625MHz/869.750MHz
FREQUENCY STABILITY	< +/- 3.0KHz (-10C to 60C)
PULSE WIDTH	Min. 208 uS Max.20mS
DATA RATE	100 - 4800 bps FSK
OPERATING TEMPERATURE	-10 C to + 60C
SUPPLY VOLTAGE	2.2 to 5.5V
SUPPLY CURRENT	22 mA (at 4.5mW/2.2V)
I/O TERMINALS	Vcc, Data In, Gnd, RF
SIZE & WEIGHT	22 x 12 x 6 mm, 3.4g
Electrical characteristics	
RF OUTPUT POWER	5mW +/-1mW
FREQUENCY STABILITY at 25 C	=<+/-0.8k
SPURIOUS EMISSION	< -50dBm (< 1GHz)
	< -46dBm (>=1GHz)
MODULATION	FM narrow
MODULATION POLARITY	Positive
INPUT SIGNAL	Digital
DATA INPUT LEVEL	Hi=VCC Lo=GND
DEVIATION	+/- 3KHz ± 0.5 (4800bps PN CODE)
FM MODULATION S/N	>= 35dB (LPF=20kHz)
ADJACENT CHANNEL POWER	200nW (4800bps PN CODE/CH=25k)
START UP TIME	5msec (Typ.)

Note: Specifications are subject to change for improvement without prior notice



# DIMENSIONS



## Caution

- As the radio module communicates with electronic radio waves, there are cases where transmission will be temporarily cut off in accordance with the surrounding environment and method of usage. The manufacturer is exempt from all responsibility relating to damage to personnel or other equipment and other secondary damage.
- Do not use the equipment within the vicinity of devices that may malfunction as a result of electronic radio waves from the radio module.
- The manufacturer is exempt from all responsibility relating to secondary damage for the operation, performance and reliability of equipment connected to the radio module.
- Communication performance will be affected by the surrounding environment, so communication tests should be carried out before actual use.
- Ensure that the power supply for the radio module is within the specified rating. Short circuits and reverse connections may result in overheating and damage and must be avoided at all costs.
- Ensure that the power supply has been switched off before attempting any wiring work.
- The case is connected to the GND terminal of internal circuit, so do not contact the '+' side of the power supply terminal to the case.
- When batteries are used as the power source, avoid short circuits, recharging, dismantling, and pressure. Failure to observe this may result in the outbreak of fire, overheating and damage to the equipment. Remove the batteries when the equipment is not to be used for a long period of time. Failure to observe this may result in battery leaks damaging the equipment.
- Do not use this equipment in vehicles with the windows closed, in locations where it is subject to direct sunlight, or in locations with extremely high humidity.
- The radio module is neither waterproof nor splash proof. Ensure that it is not splashed with soot or water. Do not use the equipment which water or other foreign objects enter the case.
- Do not drop the radio module or otherwise subject it to strong shocks.
- Do not subject the equipment to condensation (including moving it from cold locations to locations with a dramatic increase in temperature.)
- Do not use the equipment in locations where it is likely to be affected by acid, alkalis, organic agents or corrosive gas.
- Do not bend or break the antenna. Metallic objects placed in the vicinity of the antenna will have a great effect on communication performance. As far as possible, ensure that the equipment is placed well away from metallic objects.
- The GND for the radio module will also affect communication performance. If possible, ensure that the case GND and the circuit GND are connected to a large GND pattern.

## Warning

- Do not take a part or modify the equipment.
- Do not remove the product label (the label adhering to the upper surface of the module.) The use of modules from which the label has been removed is prohibited.