

Application Note

Ref. : ARF Antenna Switch

Author : CCE

434 MHZ ANTENNA SWITCH

1 - PRESENTATION OF THE DOCUMENT

The purpose of this document is to present the antenna function - why to use it, and how to achieve this function simply and inexpensively.

2 - WHY AN ANTENNA SWITCH

Two functions are incorporated together on any type of transceiver, transmission of a radiofrequency signal and receipt of this same signal. In order to use a single access for the radio signal (antenna, coaxial cable, etc.), the transmitter output and the receiver input therefore have to be connected together. However, considerations on the impedance (which must be kept as close as possible to 50 Ω), plus a difference of power level between the transmitter output and the receiver input do not enable the two radio functions to be connected directly.

As far as the transmitter is concerned, if its output is connected at the same time to the antenna and to the receiver input (on standby or powered off), a part of the power transmitted will be drawn off in the direction of the receiver. This will result in a loss of the useful transmitted signal level, and mismatching of the transmitter, which may give rise to generation of harmonics. Furthermore, the receiver can be specified at a maximum input power level lower than the transmission level, which means that a direct connection could therefore damage the first stages of the receiver.

The receiver part can, for the same reasons, lose a part of the power received to the transmitter and therefore be subject to a loss of sensitivity (which has a direct influence on the transmission range).

It is therefore clear that a device enabling isolation of the receiver during transmission phases (and vice-versa) improves the characteristics of the radio link.

3 - EXAMPLE OF AN ANTENNA SWITCH EMBODIMENT

The function to be performed is therefore the following:

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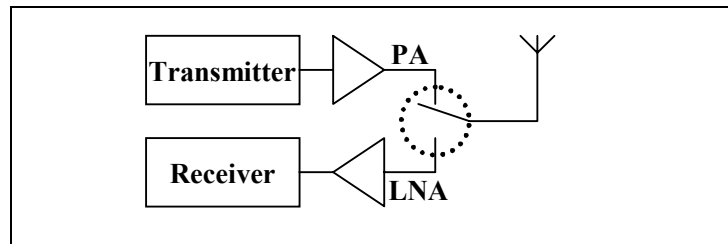


Figure 1 : Antenna switch wiring diagram

Switching of the radiofrequency signal is performed by means of PIN diodes. Their main characteristic is to polarise by a low frequency command without being affected by the high frequency signal.

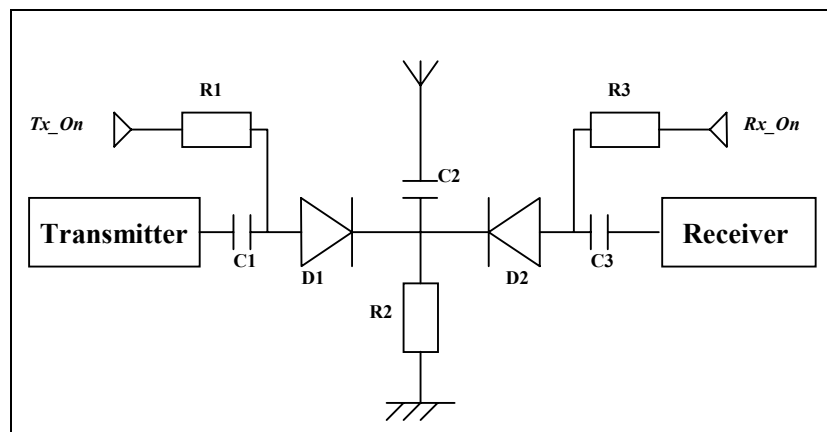


Figure 2 : Antenna switch wiring diagram

Parts identification for 434 MHz antenna switch:

- R1,R2,R3 2.2 k Ω resistors (5V version), 1.2 k Ω resistors (3V version).
- C1,C2,C3 150 pF capacitors
- D1,D2 BA682 PIN diodes

This switch is controlled by means of two signals : ***Tx_On*** and ***Rx_On***.

- Transmission phase: ***Tx_On*** = 5 V, ***Rx_On*** = 0 V.
The diode D1 is polarised (on), the diode D2 is off. The transmitter is connected to the antenna and isolated from the receiver.
- Receipt phase: ***Tx_On*** = 0 V, ***Rx_On*** = 5 V.
The diode D1 is off, the diode D2 is polarised. The receiver is connected to the antenna and isolated from the transmitter output.
- Standby phase: ***Tx_On*** = 0 V, ***Rx_On*** = 0 V. Both accesses are off.

Warning : A control logic must make sure that only one of the two signals is active.

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It is possible to reduce to a single command with an inverter between *Tx_On* and *Rx_On*. In this case, the switch will consume permanently, whatever its state, and will not have the possibility of switching to low consumption mode.

4 - PERFORMANCES (AT 434 MHZ)

- Vdc = 5.0 volts or 3.0 volts.
- Idc = 1 mA.
- Insertion losses in On mode = 1 dB max.
- Isolation in Off mode = 10 dB.