European Applications for RF2403 Cordless Telephone Front End RFIC

A front end RFIC for cordless telephone applications has been developed for use in the 902MHz to 928MHz ISM (Industrial-Scientific-Medical) band in the United States under Part 15 of the FCC Rules. Potential applications for this RFIC in this frequency band include cordless telephones, wireless LANs, wireless security systems and point-of-sale (POS) terminals.

This RFIC, the RF2403, consists of a single-stage LNA, a two-stage PA with 21dBm of output power and a transmit/receive switch. The RFIC is built using a commercial GaAs MESFET process, and is packaged in a SOP-16 narrowbody surface-mount package. The circuit operates with a +5.0V supply, and has separate enable lines which control the bias to the transmit and receive functions. All bias and control signals operate with voltages which lie between ground potential and V_{DD}. With both enable lines at logic low, the circuit is in a "power down" mode in which it draws approximately 1.0mA of leakage current from the V_{DD} supply. Some external passive components are required, primarily for DC blocking and RF bypassing functions. The PA output impedance matching circuitry, consisting of a pi-network, is realized using external passive components in order to both conserve die area and to reduce parasitic losses. This same RFIC has been evaluated for use in 433MHz European applications, and has been found to have very good RF performance there.

Although no changes have been made to the RFIC itself, several changes to the application circuit are necessary for operation at 433MHz. Table 1 shows the component values for both versions of the RF2403 application circuit. The two application schematics are shown, for 433MHz operation and for 915MHz operation, in Figures 1 and 2, respectively. The resulting RF performance for these circuits is shown in Table 2. The I/O port return losses are somewhat degraded at 433MHz, primarily due to the excess reactance of the on-chip DC blocking capacitors in the RFIC. The RF2403 does have comparable gain, output power and linearity at 433MHz with respect to its performance at 915MHz.

RF Specification	Measured Performance (All Typical) @V_{DD}=5.0V	
	433MHz Circuit	915MHz Circuit
LNA Gain[1]	17dB	16dB
LNA NF[1]	2.4dB	2.7dB
LNA P_{1dB}[1]	+6.0dBm	+6.0dBm
RX IRL, ANT port[1]	6.0dB	9.0dB
LNA ORL	15dB	13dB
PA Small Signal Gain[1]	28dB	28dB
PA P_{1dB}[1]	19.0dBm	21.0dBm
PA IRL	11dB	17dB
PA ORL, ANT port[1]	11.5dB	10.5dB
PA Two-tone P_{OUT}[1,2] @ -25dBc IMD3	17.5dBm	16.7dBm

Table 2. RF2403 measured performance, using the two application schematics

Note 1: Performance is measured through the monolithic T/R switch
Note 2: f_1=432.5MHz, f_2=433.5MHz, or, f_1=914.5MHz, f_2=915.5MHz

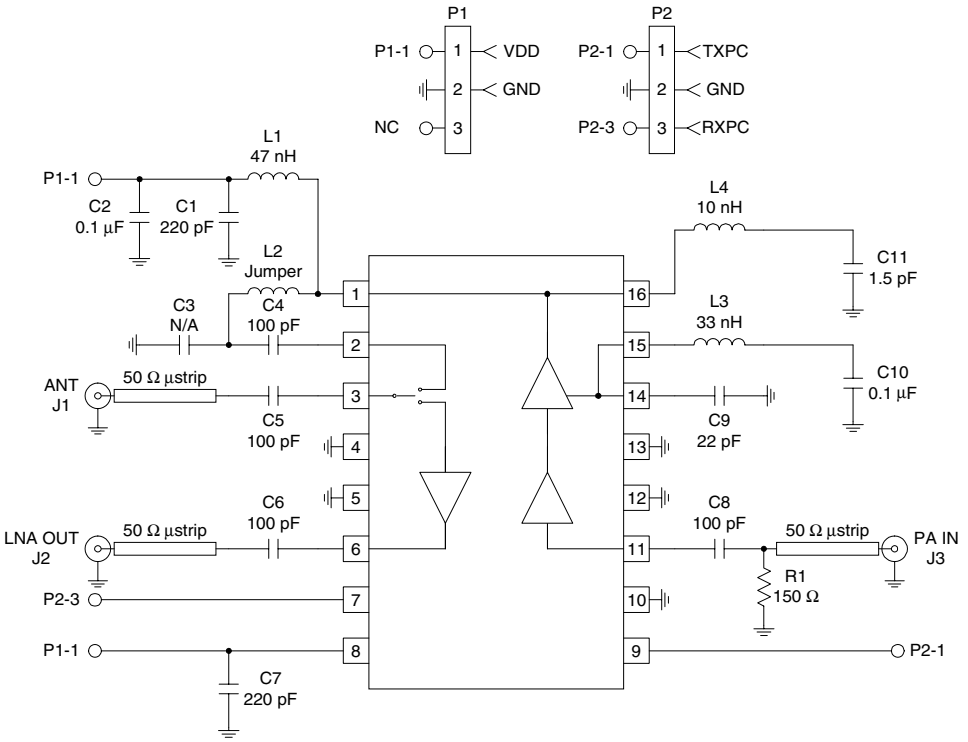

Figure 1. RF2403 Application Circuit for 433 MHz European Applications

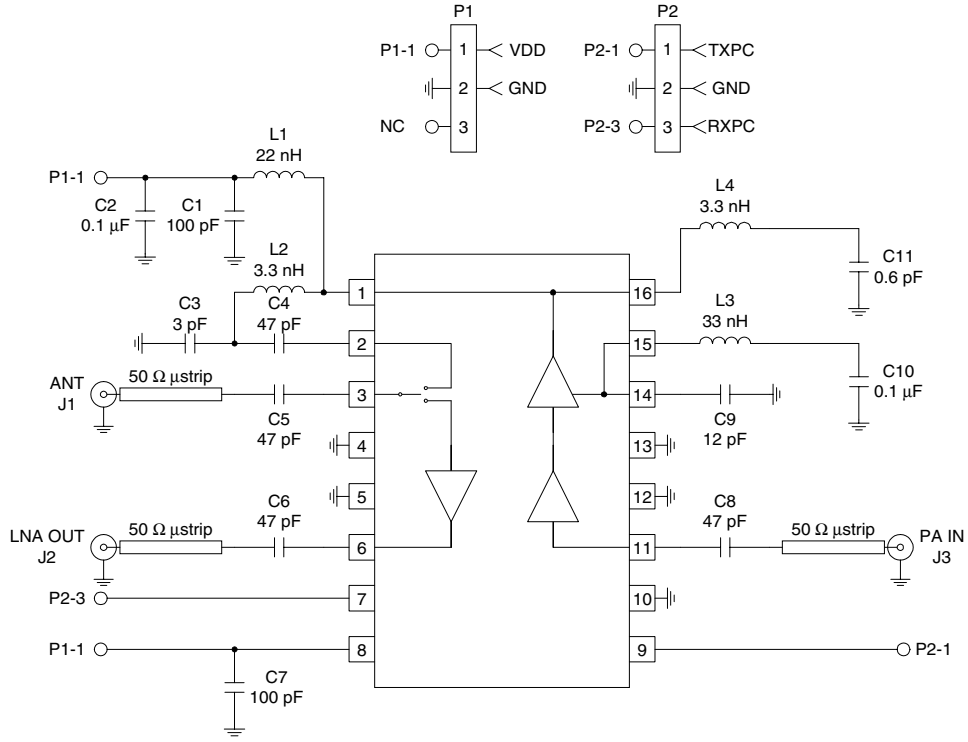

Figure 2. RF2403 Application Circuit for 915 MHz ISM Applications

Component Designation	Value (0805 size, unless noted otherwise)	
	433MHz Circuit	915MHz Circuit
C1	220pF	100pF
C2	0.1µF	0.1µF
C3	Omit	3.0pF
C4	100pF	47pF
C5	100pF	47pF
C6	100pF	47pF
C7	220pF	100pF
C8	100pF	47pF
C9	22pF	12pF
C10	0.1µF	0.1µF
C11	1.5pF ATC 100A	0.6pF ATC 100A
L1	47nH	22nH
L2	Replace with metal strip jumper	3.3nH
L3	33nH	33nH
L4	10nH	3.3nH
R1	150Ω 1206, added shunt to ground on DC-isolated side of C8	Omit

Table 1. Application circuit component values