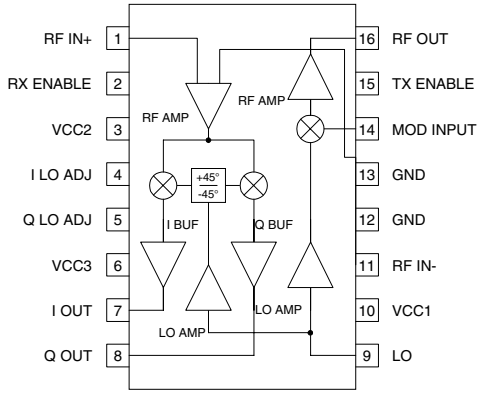
Integrated Solution Targets 900MHz Cordless Phones

Abstract
Cordless technology has evolved greatly over the past two years. The move to 900MHz and to spread-spectrum systems has forced phone developers and component manufacturers to face strict cost issues (*see Wireless* Systems *Design*, October 1996, p. 18). In order to drive prices down, system-level designers are challenging wireless manufacturers to develop more highly-integrated products. One answer to these problems is using two-chip solutions for the RF portion of the phone, such as the integrated two-chip RF front-end solution developed by RF Micro Devices.

Design Requirements

The two integrated circuits (ICs) that make up the front-end product include the RF9904 transceiver and the RF2403 transceiver front end. Geared for direct-sequence, spread-spectrum (DSSS) 900MHz cordless systems, the combined solution supports direct down-conversion from RF to baseband frequencies. By doing this, the solution eliminates a first RF image filter and an intermediate-frequency (IF) channel filter, thus reducing size and cost. Both ICs are packaged in a 16-pin SOIC plastic package.

Operating across the 700MHz to 1100MHz frequency range, the RF9904 (see Figure 1) transceiver IC includes a transmit binary phase-shift-keying (BPSK) modulator, a receiver quadrature demodulator, a splitter for the local-oscillator (LO) signal, and separate transmit and receive LO buffer amplifiers. The IC contains all of the circuits required for quadrature demodulation, using an integrated LO phase-shift network. It also includes all circuits for biphase modulation.



Meeting the needs of system designers, the transceiver IC is engineered to run from a single +3VDC to +6VDC supply. At +5VDC, the chip consumes 20mA to 35mA current in the receive path and 7mA to 20mA current in the transmit path.

The RF9904 comes equipped with a separate transmit and receive power-down control and a 0MHz to 3MHz in-phase/quadrature (I/Q) frequency. When powered-down, the IC offers a 0.5V off voltage while consuming 100ΩA current. The chip also supports a 100ns maximum switching time when going from power-down to operational mode.

On the receive side, the RF9904 supports a 1.40:1 input VSWR, 10-dB noise figure, a 3MHz baseband frequency, a 1dB compression point of 2dBm, and a +8-dBm third-order-intercept (TOI) point. In this section, the unit also offers a 5mV DC offset between I and Q as well as a 1V peak-to-peak maximum I/Q output level. The transceiver's transmit section features 6kμ modulation input impedance, 0.5V peak-to-peak modulation voltage, -10dBm typical RF output power, and -26dBc carrier suppression.

The RF2403 transceiver front end integrates a single-stage low-noise amplifier (LNA), a two-stage power amplifier, and a low-loss transmit/receive (T/R) switch in a single package. Although designed for cordless phones operating across the 915MHz range, the device can be used in applications within an octave of 915MHz since the IC has little on-chip tuning circuitry.

This front-end device offers independent transmit and receive lines which enable it to be driven be complementary-metal-oxide-semiconductor (CMOS) logic. It also features single +5VDC operation. When working from this supply, the unit consumes 1mA to 2mA quiescent current in receive mode, and 70mA to 115mA current in transmit mode. The unit's T/R switch provides 0.8dB insertion loss and 17dB isolation.

On the transmit side, the unit offers a +15dBm to +20dBm two-tone output-power level through the T/R switch. In this mode, it also features 22dB transmit large-signal gain, 1mA to 1.5mA transmit enable-line consumption, and -27dBc to 25dBc third-order intermodulation suppression. In receive mode, the front-end IC supports a 2.9dB antenna-port noise figure, 12dB to 20dB gain, and 0.1mA to 0.5mA receive enable-line current.

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