In a previous Design Idea ("Modulator draws just 5 mA at 2.7V," EDN, June 5, 1997, pg 111), a phasing network combines with a MAX2452 modulator to form an single-sideband (SSB) modulator that accepts a 300- to 3000-Hz baseband signal and generates an SSB-modulated signal in the VHF range. The author alludes to the possibility of improved performance if the modulator IC uses differential drive. Indeed, such performance is possible, but you need no additional components; in fact, you can achieve the improvement with a simpler circuit (Figure 1). The phasing network comprises four resistor chains intercoupled with a number of capacitors. The signals from the first and third chains subtract to form the quadrature (Q) signals. You can effect the subtraction by feeding the signals from the first and third chains directly to the I inputs of the MAX2452 and feeding the signals from the second and fourth chains directly to the Q inputs of the IC. In the aforementioned Design Idea, the signal into the phasing network derives from two op amps that you connect as differential buffers. In this approach, you need no buffers; the circuit uses ac coupling for the I and Q signals.

**Figure 1** An RC network, three ICs, and a handful of discrete components provide an efficient SSB modulator for the HF band.

The circuit in Figure 1 operates in the 3- to 30-MHz band. This band uses most SSB communication, because it is difficult to achieve frequency stability (better than ±100 Hz) at higher bands. The modulating (voice) signal enters the phasing network through $C_1$, $R_1$, $R_2$, and $R_3$ provide dc bias,
which routes through the network to buffers IC₁ and IC₂. C₂ provides a good ac ground. The output buffers allow a tenfold increase in the chain resistors, to 120 kΩ. This increase allows a tenfold reduction in capacitor values and is an advantage of surface-mount construction. Phase reversal of either the I or Q differential pairs allows you select between the upper and lower sideband. IC₃ provides the selection function. The modulated signal drives the tank pins of the IC, via a 1-to-1 isolation transformer. This signal has twice the desired carrier frequency. The IF outputs are differential and have a relatively high impedance. You obtain the desired single-ended, low-impedance output by using a 1-to-1 isolation transformer and a two-transistor circuit. Q₁ must have base-collector capacitance low than 1 pF. R₄ in parallel with this capacitance defines the corner frequency for the buffer. The circuit provides more than 45-dB carrier reduction through the 3- to 30-MHz range. (DI #2420).