



Active mixer resolves passive issues

While ultra-high frequency (UHF) and microwave passive mixers are known to deliver high linearity and signal-to-noise ratio performance, they require high local oscillator (LO) drive and provide poor LO suppression and low conversion gain. **Linear Technology** has resolved these issues with passive mixers by developing high linearity active mixers for frequencies to 3.75 GHz. The newest member of this line, LT5521, is designed to meet the frequency upconversion needs of 3G base station transmitters. By avoiding the use of high-power amplifiers to drive LO and by eliminating filters to suppress leakage, this silicon bipolar-based active mixer allows designers to build 3G cellular base stations that are more compact and at a reduced cost. Furthermore, the LT5521's low distortion is suitable for cable downlink infrastructure applications.

Unlike passive mixers, which require a high LO drive level of as much as +17 dBm, the high-linearity double balanced LT5521 needs a -5 dBm LO signal to achieve excellent distortion and noise performance. This saves one or two stages of external LO amplifier, resulting in a compact size and lower cost. Moreover, the LT5521 offers reduced local oscillator leakage from the LO to other input and output ports, resulting in higher port-to-port isolation. The active mixer offers nearly 30 dB improvement in LO leakage over the passive mixer. As per the data sheet, LO-RF leakage for the LT5521 is rated at -42 dBm. This solves a design headache by removing undesirable LO signal from the transmit path.

Other features include low conversion loss, improved noise figure and high gain. Unlike passive mixers, which have high conversion loss in the range of 6 dB to 10 dB, the LT5521 has only 0.5 dB loss, contributing to improved signal-to-noise performance. Taken as a whole, these attributes result in a solution that has fewer external blocks, reduced system costs, and improved performance.

The LT5521 incorporates a differential input and output architecture, supporting high linearity over a wide operating frequency range from 10 MHz to 3.7 GHz. It provides flexible operation in an upconverting or downconverting application. As a transmit (upconverting) mixer, the input third-order intercept (IIP3) is +24.2 dBm at 1950 MHz, and the noise figure (NF) measures 12.5 dB. These two parameters contribute to a high spurious-free dynamic range (SFDR). By comparison, the LT5521 offers a 7 dB improvement in linearity over the previous generation unit (LT5511) and 1.1 dB better noise figure. While the IIP3 performance is high at room temperature, it remains above 20 dBm over the operating temperature range of -40°C to +85°C, according to the developer.

The LT5521 offers high ACPR performance in a variety of applications and includes an integrated LO buffer with single-ended input. The LO buffer is internally 50 Ω matched for wideband operation. However, it does not include RF transformer and input/output impedance-matching circuits onboard. Implemented in the second-generation bipolar process, this double-balanced active mixer operates over a supply voltage range of 3.15 V to 5.25 V. It comes in a 16-pin 4mmx4mm surface-mount QFP package. Available from stock, it costs \$4.95 in 1000 pieces.

Linear Technology Corp.
 (408) 432-1900
www.linear.com

