

# Active Mixer Provides High Dynamic Range for Applications to 3.7 GHz

This active mixer offers a wide frequency range and high dynamic range, in addition to design features that simplify design and reduce the number of external components

A new high linearity active downconverting RF mixer from Linear Technology can significantly reduce the cost and greatly simplify the design of 3G cellular basestations and other high performance

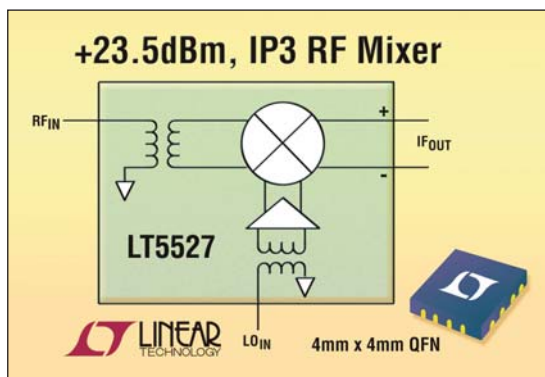
wireless equipment. The LT5527 RF mixer features an operating frequency range extending to 3.7 GHz. At 1.9 GHz, the LT5527 offers IIP3 (Input 3rd order Intercept Point) of 23.5 dBm, conversion gain of 2.3 dB, and a Noise Figure of 12.5 dB, meeting the dynamic range requirements of 3G cellular basestations and other high performance wireless infrastructure receivers.

The LT5527 operates over a wide frequency range from 400 MHz to 3.7 GHz, covering the 850 MHz cellular band, the 1.9 GHz and 2.1 GHz W-CDMA and UMTS bands, as well other high performance wireless applications that operate in bands at 450 MHz, 2.4 GHz and 3.5 GHz.

## LO Buffer Solves Design Problems

The LT5527's local oscillator (LO) and RF inputs operate single-ended and have built-in matching to a 50-ohm impedance, requiring few external matching components. The mixer also incorporates a low noise LO buffer, allowing operation at a -3 dBm LO drive level, resolving the challenges of RF isolation and reducing the need for external filtering.

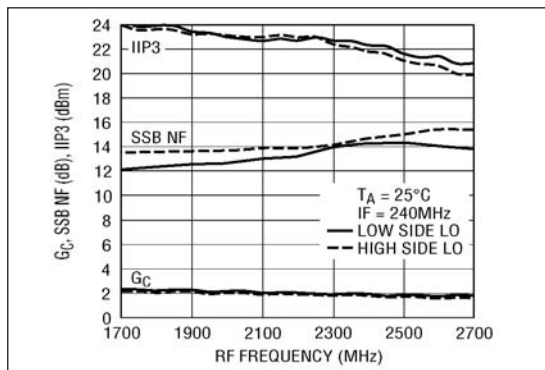
Typical passive mixers with similar dynamic range specifications require as much as 20 dB higher LO levels, consuming significant power and creating problems with LO



The LT5527 from Linear Technology supports wireless applications with high performance and valuable design features.

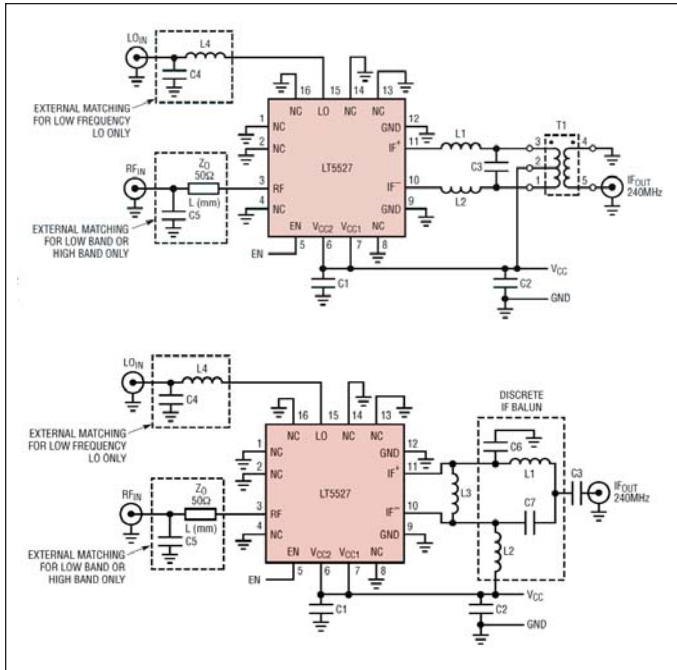
radiation and LO-RF isolation. On-chip buffer amplifiers not only provide the necessary drive levels to the mixer devices, they contain those signals within a much smaller area, which contributes to lower LO radiation.

Internal circuitry of the LT5527 has a balanced architecture. The inherent precision of the IC fabrication process assures excellent



Conversion gain, IIP3 and Noise Figure performance versus RF frequency.

COVER FEATURE



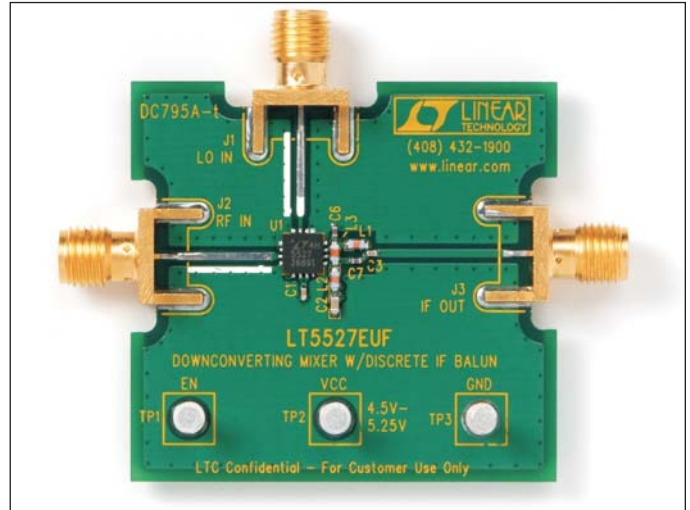
Two design options for the balanced IF output: transformer coupling (top) and a lumped-element balun network (bottom).

balance, resulting in low LO-RF leakage of  $-44$  dBm or less below 2100 MHz,  $-36$  dBm or less above that frequency. In the main signal path, RF-IF isolation is better than  $-42$  dB at the low end of the device's frequency range (400 to 800 MHz), and  $-54$  dB or better between 800 MHz and 3700 MHz.

**On-Chip Transformers Provide Matching**

The LT5527 features on-chip RF transformers at both the RF and LO inputs. The transformers facilitate 50-ohm impedance matching and allow the designer to deliver signals to these ports single-ended, simplifying product development and speeding time to market.

As shown in the figure above, the output of the mixer is balanced, as is commonly used for IF circuitry. If a sin-



A close-up view of the LT5527 demo board makes it clear that few external components are required.

gle-ended output is desired, there are well-established techniques for transforming the balanced output—which is approximately 400 ohms at 240 MHz—to the desired single-ended impedance.

The LT5527 is the first product using Linear Technology's second-generation (30 GHz  $F_T$ ) RF silicon bipolar process. The device operates from a single 5 VDC supply voltage with a typical operating current of 78 mA. The device can be shutdown by an ENABLE pin. When disabled, the chip draws 100 uA maximum quiescent current to conserve power when not being used.

The LT5527 is offered in a 16-pin  $4 \times 4$  mm surface mount QFN package. It is priced at \$5.80 each in 1,000-piece quantities and is available from stock.

**Linear Technology Corporation**  
 1630 McCarthy Blvd.  
 Milpitas, CA 95035  
 Tel: 800-4-LINEAR (454-6327)  
 www.linear.com  
 HFeLink 304

	450 MHz	900 MHz	1900 MHz	2650 MHz	3500 MHz
Input IP3	+23.2 dBm	+24.5 dBm	+23.5 dBm	+20.8 dBm	+18.2 dBm
SSB Noise Figure	13.3 dB	11.6 dB	12.5 dB	13.9 dB	16.1 dB
Conversion Gain	2.5 dB	3.4 dB	2.3 dB	1.8 dB	0.3 dB
RF Frequency:	400 MHz to 3700 MHz (1700-3000 MHz-no matching)		LO-RF Leakage:	< $-44$ dBm	
LO Frequency:	380 MHz to 3500 MHz (1200-3500 MHz-no matching)		LO-IF Leakage:	< $-50$ dBm (w/IF XFMR)	
IF Frequency:	0.1 to 600 MHz		RF-IF Isolation:	> 54 dB	
			LO Input Power:	$-3$ dBm (1200-3500 MHz) 0 dbm (380-1200 MHz)	

Key performance specifications of the LT5527.