

DESCRIPTION

Demonstration circuit 1027A is optimized for down-converting mixer tests & measurements for input frequency range of 79MHz to 300MHz and an output frequency range of 3MHz to 67MHz, (for 12dB return loss). The LO port frequency range is 176MHz to 316MHz (10dB return loss). Demo circuit 1027A can also be optimized for HF, VHF up-converting applications.

The LT[®]5560 is a 0.01MHz to 4000MHz low power, high performance broadband Up/Down-converting active mixer. This double-balanced mixer can be driven by a single-ended LO source and requires – 2dBm of LO power. The signal ports can be impedance matched to a broad range of frequencies,

which allow the LT[®]5560 to be used as an up- or down-conversion mixer in a wide variety of applications.

The LT[®]5560 is characterized with a supply current of 10mA; however, the DC current is adjustable, which allows the performance to be optimized for each application by changing the value of resistor R1. For I_{CC}=10mA the value of R1=3 Ohm. Operation at a lower supply current will, however, degrade linearity.

Design files for this circuit board are available. Call the LTC factory.

LT is a registered trademark of Linear Technology Corporation.

Table 1. Typical Performance Summary (T_A = 25°C)

PARAMETER	CONDITION (f _{input} = 250MHz, f _{LO} =260MHz)	VALUE
Supply Voltage		2.7V to 5.3V
Supply Current	V _{CC} = 3V, EN = High, R1=3	10mA
Maximum Shutdown Current	V _{CC} = 3V, EN = 0.3V	10μA
Signal Input Frequency Range	Requires External Matching	< 4000 MHz
LO Signal Frequency Range	Requires External Matching	< 4000 MHz
Signal Output Frequency Range	Requires External Matching	< 4000 MHz
IF Input Return Loss	Z ₀ = 50 Ω, with External Matching	15dB
LO Input Return Loss	Z ₀ = 50 Ω, with External Matching	15dB
RF Output Return Loss	Z ₀ = 50 Ω, with External Matching	15dB
LO Input Power		-6dBm to 1dBm
Conversion Gain	P _{INPUT} = -20dBm, P _{LO} = -2dBm	2.7dB
SSB Noise Figure	P _{LO} = -2dBm	8.8dB
Input 3 rd Order Intercept	2-Tone, -20dBm/Tone, delta f = 1MHz, P _{LO} = -2dBm	+9.6dBm
Input 2 nd Order Intercept	2-Tone, -20dBm/Tone, delta f = 1MHz, P _{LO} = -2dBm	+46dBm
Input 1dB Compression	P _{LO} = -2dBm	0.4dBm
LO to IN leakage	P _{LO} = -2dBm	-63dBm
LO to OUT leakage	P _{LO} = -2dBm	-44dBm

QUICK START PROCEDURE

Demonstration circuit 1027A is easy to set up to evaluate the performance of the LT[®]5560. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE:

- a. Use high performance signal generators with low harmonic output. Otherwise, low-pass filters at the signal generator outputs should be used to suppress harmonics, particularly the 2nd harmonic.
 - b. High quality combiners that provide a 50 Ohm termination on all ports and have good port-to-port isolation should be used. Attenuators on the outputs of the signal generators are recommended to further improve source isolation and to reduce reflection into the sources.
1. Connect all test equipment as shown in Figure 1.
 2. Set the DC power supply's current limit to 15mA, and adjust output voltage to 3V.
 3. Connect Vcc to the 3V DC supply, and then connect EN to 3V; the Mixer is enabled (on).
 4. Set Signal Generator #1 to provide a 260MHz, -2dBm, CW signal to the demo board LO input port.
 5. Set the Signal Generators #2 and #3 to provide two -20dBm CW signals to the demo board RF input port—one at 250MHz, and the other at 251MHz.
 6. To measure 3rd order distortion and conversion gain, set the Spectrum Analyzer start and stop frequencies to 7MHz and 12MHz, respectively. Sufficient spectrum analyzer input attenuation should be used to avoid distortions in the instrument.
 7. The 3rd order intercept point is equal to $(P_1 - P_3) / 2 + P_{in}$, where P_1 is the power level of the two fundamental output tones, at 9MHz and 10MHz, P_3 is the 3rd order distortion products at 8MHz or 11MHz, and P_{in} is the input power (in this case minus 20dBm). All units are in dBm.
 8. Using the same signal generator settings, output IM2 product can be measured at 1MHz, which is a difference between two input frequencies (250MHz and 251MHz). However we recommend increasing the frequency of the second signal generator from 251MHz to 253MHz and measure the output IM2 product at 3MHz frequency (253MHz-250MHz=3MHz). At 3MHz the mixer output matching circuit has good return loss. To measure input 2nd order distortion, set the Spectrum Analyzer center frequency to 3MHz.
 9. The 2nd order intercept point is equal to $P_1 - P_2 + P_{in}$, where P_1 is the power level of the fundamental output tone at 7MHz, P_2 is the 2nd order product at 3MHz, and P_{in} is the input power (in this case minus 20dBm).

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1027A

LOW POWER ACTIVE MIXER

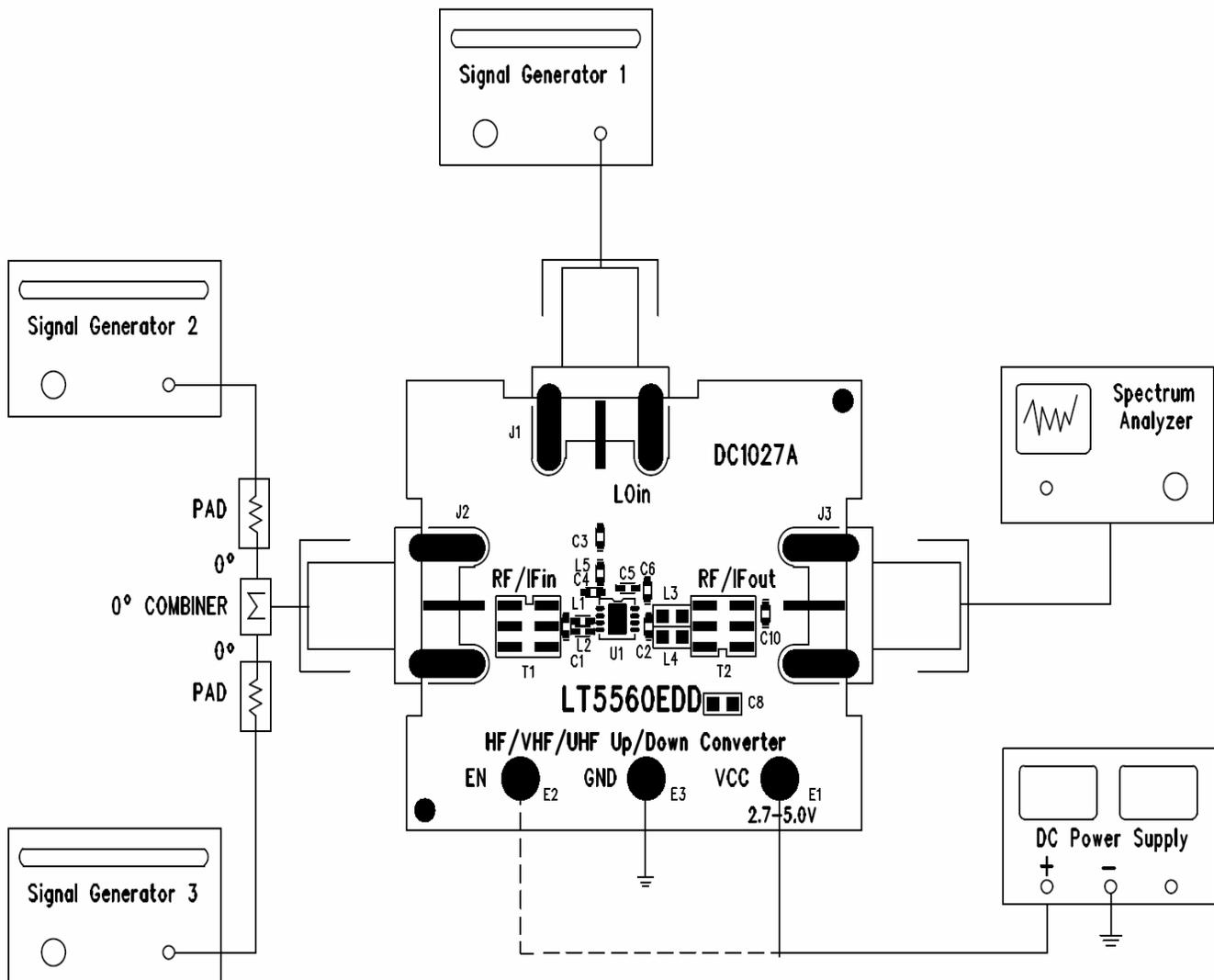
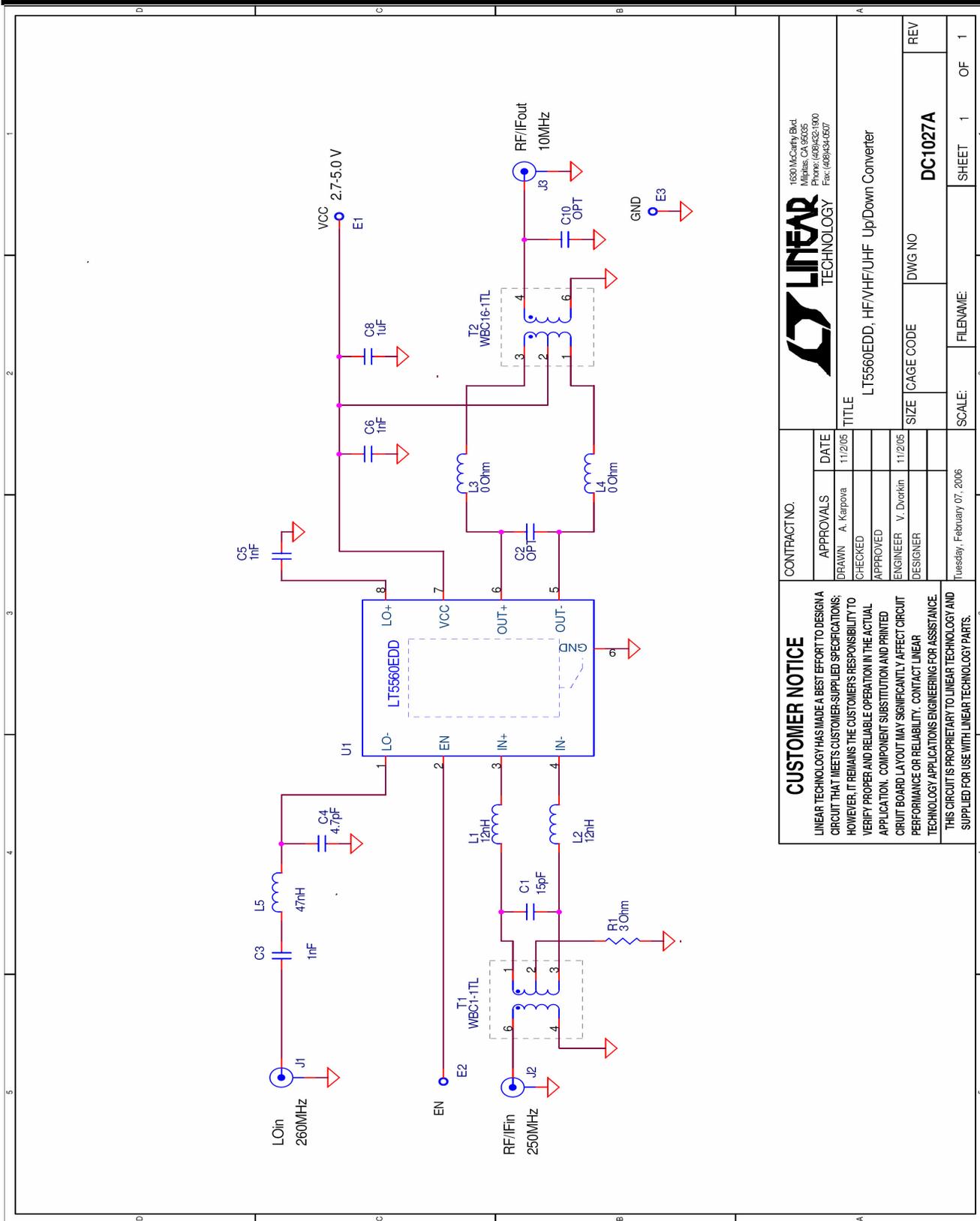


Figure 1. Proper Measurement Equipment Setup

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1027A

LOW POWER ACTIVE MIXER



CUSTOMER NOTICE		CONTRACT NO.	
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.		DRAWN: A. Karpova	
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.		DATE: 11/20/05	
		CHECKED:	
		APPROVED:	
		ENGINEER: V. Dvorkin	
		DESIGNER:	
		Tuesday, February 07, 2006	
		SCALE:	
		FILENAME:	
		SHEET 1 OF 1	
		DWG NO: DC1027A	
		REV:	
		TITLE: LT5560EDD, HF/VHF/UHF Up/Down Converter	
		SIZE: CAGE CODE	
		REV: 1	



16301 McCarty Rd.
 Milpitas, CA 95035
 Phone: (408) 252-1000
 Fax: (408) 252-1607