

# 300MHz to 4GHz Active Downconverting Mixer with Wideband IF

## DESCRIPTION

Demonstration circuit 1861A is optimized for evaluation of the LTC<sup>®</sup>5567 active downconverting mixer. Its RF and LO input ports are internally matched to 50Ω, from 1.4GHz to 3GHz, and from 1GHz to 4GHz, respectively. The IF output uses a bandpass network followed by an 8:1 transformer to provide a 50Ω match at 153MHz. The LO input is easily matched for higher or lower frequencies, as low as 300MHz, with simple external matching. The low-capacitance differential IF output is usable up to 2.5GHz.

Design files for this circuit board are available at <http://www.linear.com/demo>

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage ( $V_{CC}$ , $IF^+$ , $IF^-$ ) .....	4.0V
Enable Input Voltage (EN) .....	-0.3V to $V_{CC}$ + 0.3V
LO Input Power (350MHz to 4.5GHz) .....	+10dBm
LO Input DC Voltage.....	±0.1V
RF Input Power (300MHz to 4GHz) .....	+15dBm
RF Input DC Voltage.....	±0.1V
TEMP Monitor Input Current.....	10mA
Operating Temperature Range ( $T_C$ ).....	-40°C to 105°C
Junction Temperature ( $T_J$ ) .....	150°C
Storage Temperature Range .....	-65°C to 150°C

CAUTION: This part is sensitive to electrostatic discharge (ESD). Observe proper ESD precautions when handling the LT5567.

LT, LT, LTC, LTM, μModule, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

## BOARD PHOTO

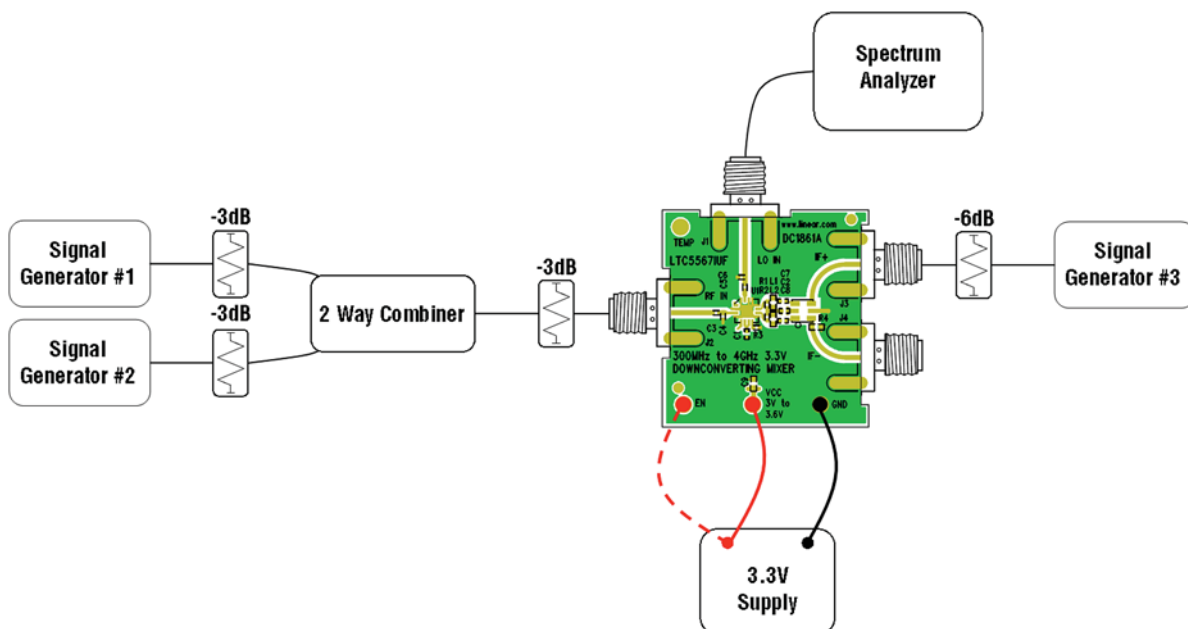


Figure 1. Test Setup for Mixer Two-Tone Measurements

## NOTES ON TEST EQUIPMENT AND SETUP

- High performance signal generators with low harmonic outputs should be used for 2-tone measurements. Otherwise, lowpass filters at the signal generator outputs should be used to suppress harmonics.
- High quality combiners should be used to present a broadband 50Ω termination on all ports as well as provide good port-to-port isolation. Attenuator pads may be used on the inputs to the combiner and the RF input port of the LTC5567 mixer shown in Figure 1. Adding attenuator pads further improves source isolation and helps prevent the signal generators from producing intermodulation products.
- Spectrum analyzers can produce significant internal distortion products if they are overdriven. Generally, spectrum analyzers are designed to operate at their best with about –30dBm to –40dBm at their input. The spectrum analyzer’s input attenuation setting should be used to avoid saturating the instrument. Set the spectrum analyzer’s input attenuation depending on the spectrum analyzer used.
- Before performing measurements on the DUT, the system performance should be evaluated to ensure that a clean input signal is obtained and that the spectrum analyzer’s internal distortion is minimized.

## QUICK START PROCEDURE

1. Connect all test equipment as shown in Figure 1.
2. Set the power supply output voltage to 3.3V, and set the current limit to 150mA.
3. Connect the V<sub>CC</sub> pin to the 3.3V supply. Connect EN to the 3.3V supply. **BE SURE TO CONNECT THE V<sub>CC</sub> PIN BEFORE THE EN PIN TO ENSURE THAT THE PART DOES NOT GET DAMAGED. ALSO, REMOVE POWER FROM EN PIN BEFORE REMOVING POWER FROM THE V<sub>CC</sub> PIN.**
4. Set the LO signal generator to provide a 1800MHz CW signal at about 0dBm to the demo board’s LO port.
5. Set the RF signal generators to provide one 1950MHz CW signal and one 1951MHz CW signal. The signals should be applied to the 2-way combiner. The output of the combiner should be applied to the demo board’s RF input port. The two tones should be set to about –6dBm each at the mixer’s RF input port.
6. Set the spectrum analyzer’s center frequency to 150MHz.
7. Perform various measurements (Conversion Gain, OIP3, LO leakage, etc.)

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	2	C1, C2	CAP, X7R, 0.01μF, 25V, 10%, 0402	AVX, 04023C103KAT
2	1	C3	CAP, NPO, 2.7pF, 50V, 5%, 0402	AVX, 04025A2R7JAT
3	0	C4, C6	TBD, 0402	
4	1	C5	CAP, NPO, 3.9pF, 50V, 5%, 0402	AVX, 04025A3R9JAT
5	2	C7, C8	CAP, NPO, 330pF, 16V, 5%, 0402	AVX, 0402YA331JAT
6	1	C9	CAP, X7R, 1μF, 10V, 10%, 0603	AVX, 0603ZC105KAT
7	4	E1-E4	TESTPOINT, TURRET, 0.063" PBF	MILL-MAX, 2308-2-00-80-00-00-07-0
8	4	J1-J4	CONN, SMA, 50Ω EDGE-LANCH	E. F. JOHNSON, 142-0701-851(PBF)
9	2	L1, L2	INDUCTOR, WIREWOUND, 300nH, ±5%, 0603	COILCRAFT, 0603HP-R30XJLW
10	2	R1, R2	RES, CHIP, 3.01k, 1/16W, 1% 0402	VISHAY, CRCW04023K01FKED
11	0	R3	TBD, 0402	
12	1	R4	RES, CHIP, 0Ω, 0603	NIC NRC060000TRF
13	1	T1	RF TRANSFORMER, TC8-1-10LN+	MINI-CIRCUITS, TC8-1-10LN+
14	1	U1	I.C. LTC5567IUF, QFN 16 PIN, 4mm × 4mm	LINEAR TECH. INC., LTC5567IUF

dc1861af



# DEMO MANUAL DC1861A

---

## DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

**Please read the DEMO BOARD manual prior to handling the product.** Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology  
1630 McCarthy Blvd.  
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation