

LTC5569

300MHz to 4GHz 3.3V DUAL ACTIVE DOWNCONVERTING MIXER

DESCRIPTION

Demonstration circuit DC1719A is optimized for evaluation of the LTC[®]5569 dual active downconverting mixer. Its RF and LO input ports are internally matched to 50Ω from 1.4GHz to 3.3GHz, and from 1GHz to 3.5GHz, respectively. The IF output uses a bandpass network followed by an 8:1 transformer to provide a 50Ω match at 190MHz. The LTC5569 dual active mixer is optimized for diversity and for MIMO receiver applications that require low power and small size. Each mixer includes an independent LO buffer amplifier, an active mixer core, and a bias circuit with an enable pin. The symmetry of the IC assures that a phase and amplitude coherent LO is applied to each mixer. Broadband integrated transformers on the RF and LO inputs provide single-ended 50Ω interfaces. The differential IF outputs allow convenient interfacing to differential IF filters and amplifiers.

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

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CCA} , V_{CCB} , IFA^+ , IFA^- , IFB^+ , IFB^-).....	4V
Enable Input Voltage (ENA , ENB)	-0.3V to $V_{CC} + 0.3V$
Mixer Bias Voltage ($BIASA$, $BIASB$)	-0.3V to $V_{CC} + 0.3V$
LO Input Power (350MHz to 4.3GHz)	10dBm
LO Input DC Voltage.....	$\pm 0.1V$
RF Input Power (300MHz to 4GHz)	15dBm
RF Input DC Voltage (RFA , RFB)	$\pm 0.1V$
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 LTC5569.

LT, LT, LTC, LTM, 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

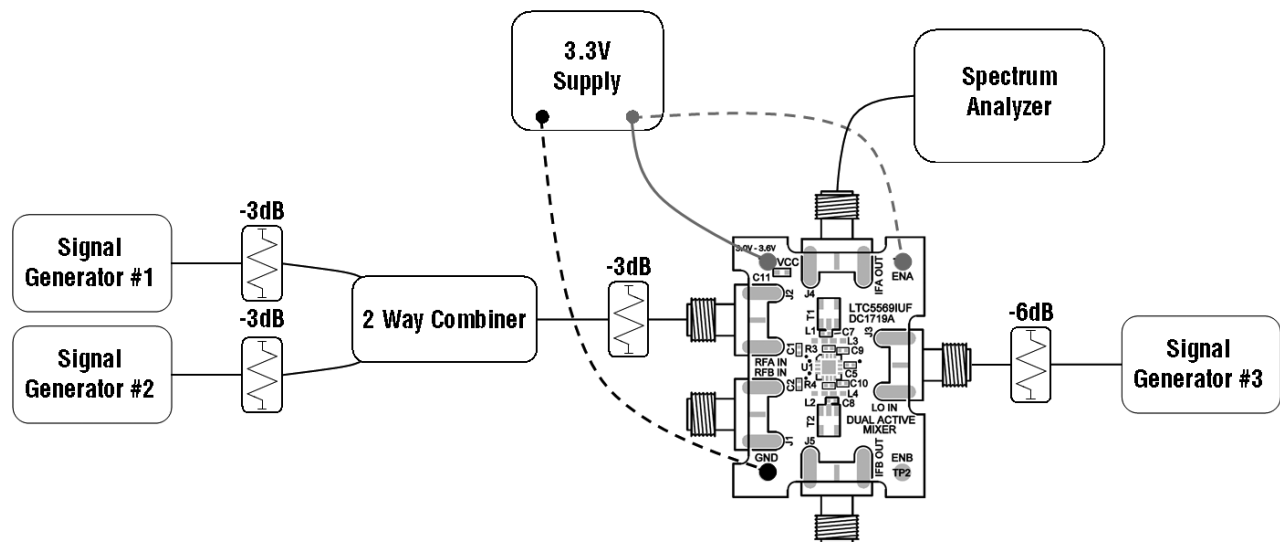


Figure 1. Test Setup for Mixer 2-Tone Measurements

NOTES ON TEST EQUIPMENT AND SETUP

- Use high performance signal generators with low harmonic outputs for 2-tone measurements to avoid distortion. 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 LTC5569 mixer, as 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 250mA.
3. Connect the V_{CC} pin to the 3.3V supply. Connect ENA to the 3.3V supply.
BE SURE TO CONNECT THE V_{CC} PIN BEFORE THE ENA PIN TO ENSURE THAT THE PART DOES NOT GET DAMAGED. ALSO, REMOVE POWER FROM ENA PIN BEFORE REMOVING POWER FROM THE V_{CC} PIN.
4. Set the LO signal generator to provide a 2140MHz 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 RFA 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 190MHz.
7. Perform various measurements (conversion gain, OIP3, LO leakage, etc.).

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	2	C1, C2	0402 2.7pF ±0.25pF 50V NPO	AVX, 04025A2R7CAT2A
2	1	C5	CAP, 0402 3.9pF ±0.1pF 50V NPO	AVX, 04025A3R9BAT
3	4	C7, C8, C9, C10	CAP, 0402 10nF 10% 25V X7R	AVX, 04023C103KAT
4	1	C11	CAP, 0603 2.2μF 10% 6.3V X5R	AVX, 06036D225KAT
5	5	J1, J2, J3, J4, J5	CONN, BNC, SMA 50Ω EDGE-LANCH	E. F. JOHNSON, 142-0701-851
6	4	L1, L2, L3, L4	0603 180nH 2%	COILCRAFT, 0603HP-R18XGL
7	0	R1, R2, R3, R4	RES, 0402 OPTION	OPTION
8	4	TP1, TP2, TP3, TP4	TURRET	MILL-MAX, 2308-2-00-80-00-00-07-0
9	2	T1, T2	XFMR, WIDEBAND 2MHz TO 500MHz	MINI-CIRCUITS, TC8-1+
10	1	U1	IC, DUAL ACTIVE DOWNCONVERTING MIXER	LINEAR TECHNOLOGY, LTC5569IUF

dc1719af

SCHEMATIC DIAGRAM

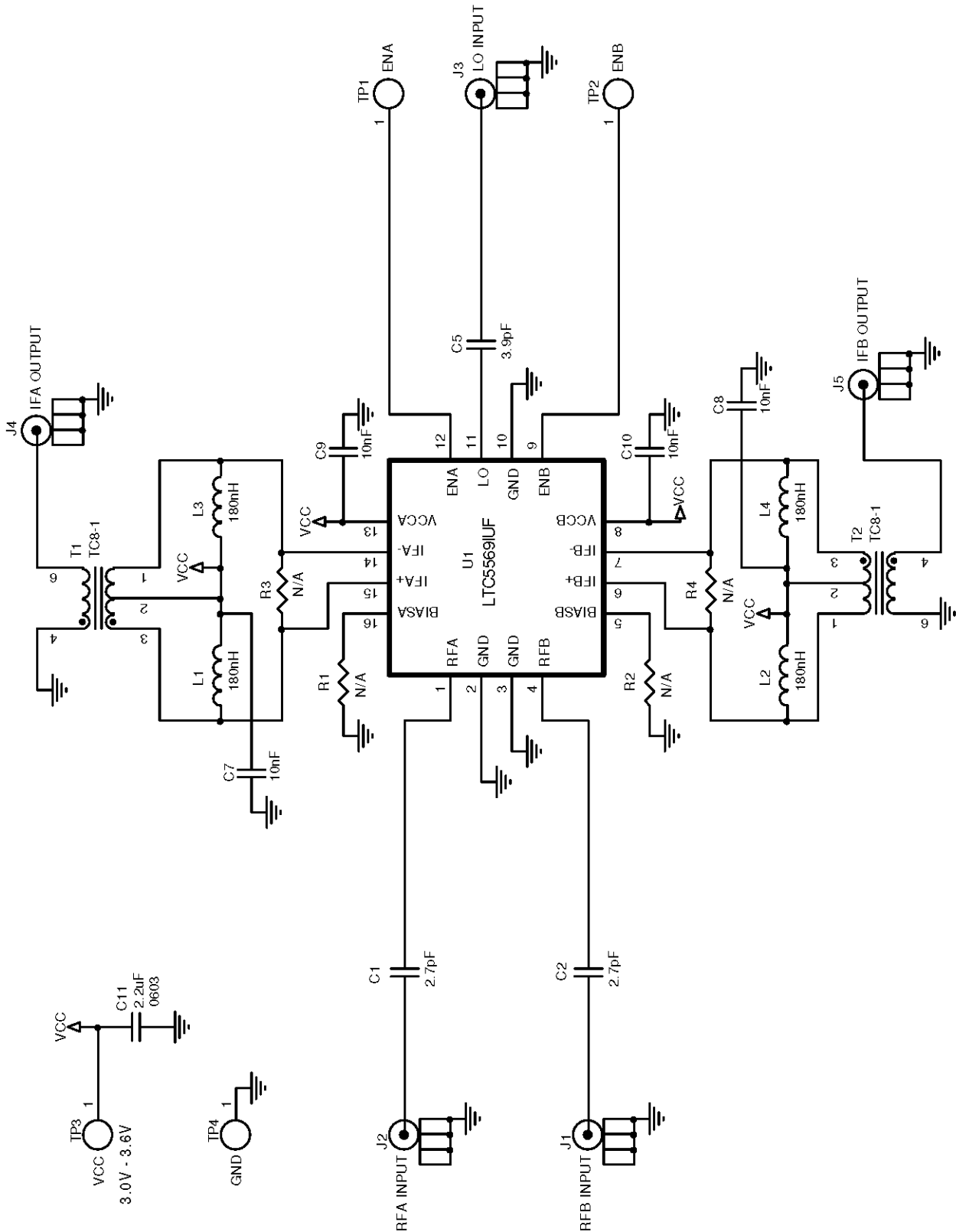


Figure 2. Dual Active Mixer

DEMO MANUAL DC1719A

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