

# LTC5566

## 300MHz to 6GHz Dual Programmable Gain Downconverting Mixer

### DESCRIPTION

Demonstration circuit 2460A is optimized for evaluation of the LTC<sup>®</sup>5566 dual programmable gain downconverting mixer. Each channel incorporates an active mixer and a digital IF VGA with 15.5dB gain control range. The IF gain of each channel is independently programmable through the SPI in 0.5dB steps. Its single-ended RF ports are tunable via the SPI or parallel control lines and have a range from 300MHz to 6GHz. The LO port is always matched to 50Ω from 150MHz to 6GHz with 10dB return loss. The differential IF port is usable from 1MHz to 500MHz. There is a reduced power mode available through the SPI, which lowers the total current consumption by 25%.

Design files for this circuit board are available at <http://www.linear.com/demo/DC2460A>

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### ABSOLUTE MAXIMUM INPUT RATINGS

#### Supply Voltage

(V <sub>DD</sub> , V <sub>CC1</sub> , V <sub>CC2</sub> , IF1 <sup>+</sup> , IF1 <sup>-</sup> , IF2 <sup>+</sup> , IF2 <sup>-</sup> )	.....4V
EN1, EN2, T0, T1 Input Voltages	.....-0.3V to V <sub>CC</sub> + 0.3V
LO <sup>+</sup> , LO <sup>-</sup> Input Power (150MHz to 6GHz)	.....+10dBm
RF1, RF2 Input Power (300MHz to 6GHz)	.....+20dBm
LO <sup>+</sup> , LO <sup>-</sup> Input DC Voltage	.....±0.5V
IF DVGA Peak Differential Input Voltage	.....±4V
SDI, CLK, CSB, PS Input Voltages	.....-0.3V to V <sub>DD</sub> + 0.3V
SDO Output Current	.....±10mA
Operating Temperature Range (T <sub>C</sub> )	.....-40°C to 105°C
Junction Temperature (T <sub>J</sub> )	.....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 LTC5566.

### BOARD LAYOUT

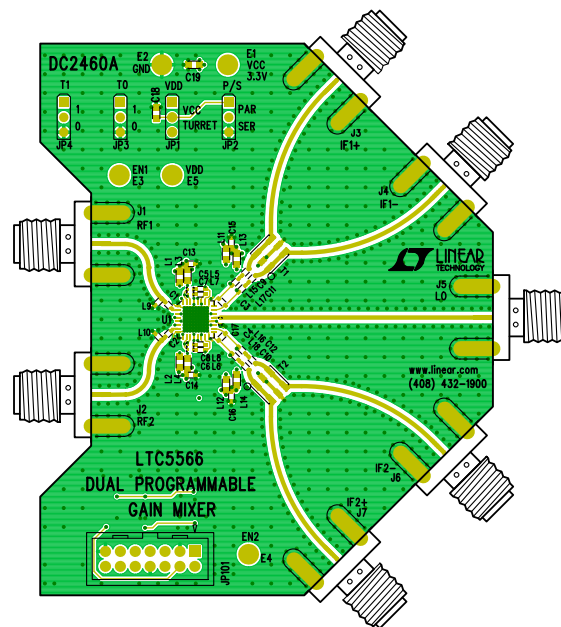


Figure 1. DC2460A

PROPER TEST SETUP

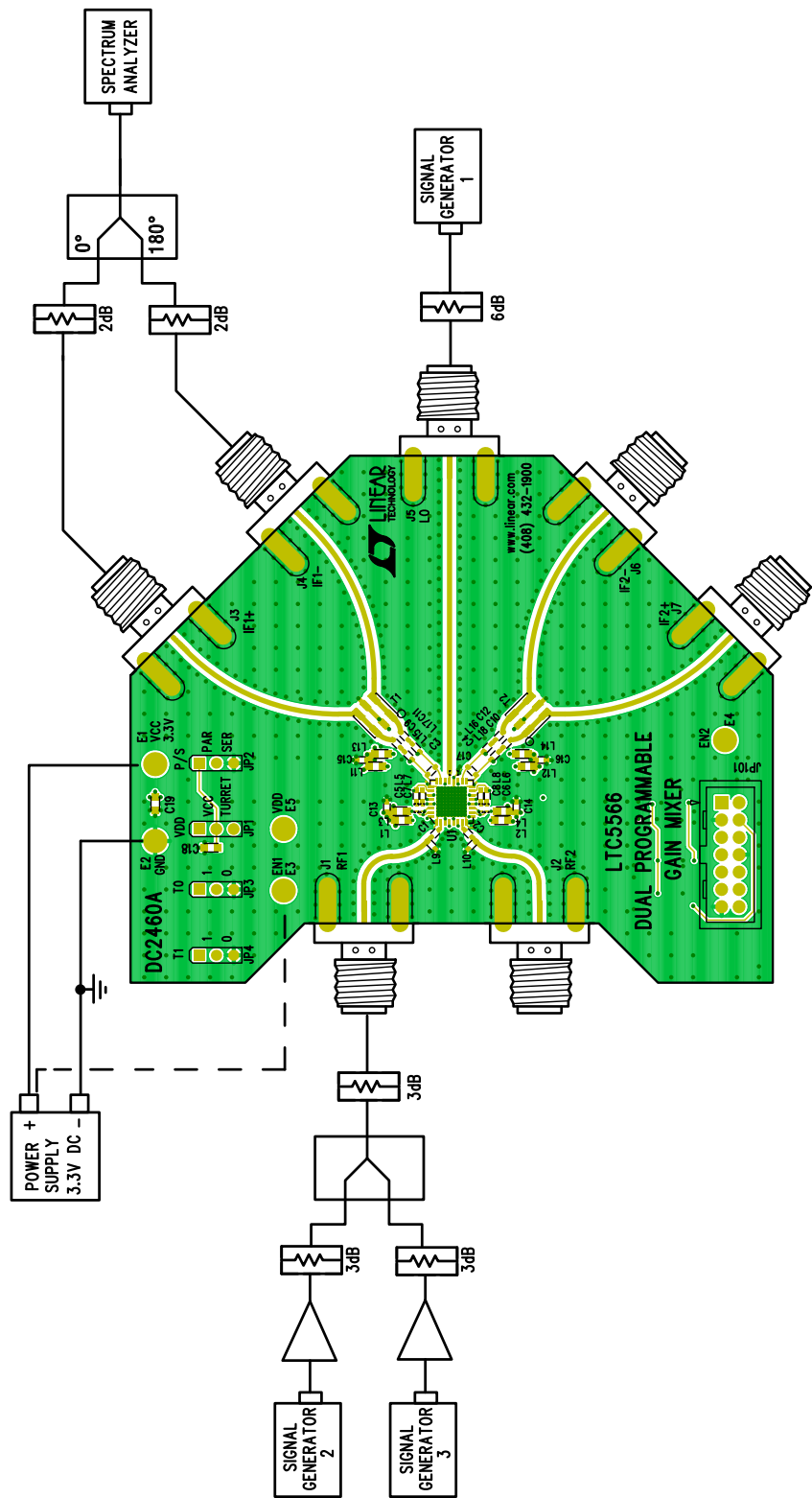


Figure 2. Test Setup for Downconverting Mixer 2-Tone Measurement

## NOTES ON TEST EQUIPMENT AND SETUP

- High performance signal generators with low harmonic outputs should be used for 2-tone measurements. Otherwise, low pass filters at the signal generator outputs should be used to suppress harmonics.
- High quality combiners should be used to present a broadband  $50\Omega$  termination on all ports as well as provide good port-to-port isolation. 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  $-30\text{dBm}$  to  $-40\text{dBm}$  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 2.
2. Set the power supply output voltage to 3.3V, and set the current limit to 500mA.
3. Connect the ground and  $V_{CC}$  turrets to the power supply.  
**BE SURE TO CONNECT THE  $V_{CC}$  TURRET BEFORE THE EN TURRET TO ENSURE THAT THE PART DOES NOT GET DAMAGED. ALSO, REMOVE POWER FROM EN TURRET BEFORE REMOVING POWER FROM THE  $V_{CC}$  TURRET.**
4. Connect the EN turret to the power supply.
5. Set the LO signal generator to provide a 2753MHz CW signal at about 0dBm to the demo board's LO port.
6. Set the RF signal generators to provide one 2599MHz CW signal and one 2601MHz 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 RF1 input port. The two tones should be set to -8dBm each at the mixer's RF1 input port.
7. Set the spectrum analyzer's center frequency to 153MHz with a span of 10MHz. Combine the DC2460A IF1+ and IF1- Outputs using a 180° combiner. Connect the combiner's output to the spectrum analyzer.
8. Perform various measurements (Conversion Gain, OIP3, LO leakage, etc).

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	2	C1, C2	CAP, 4.3pF, C0G, 50V, $\pm 0.1$ pF, 0402	Murata, GJM1555C1H4R3BB01
2	6	C3, C4, C102-C105	CAP, 2.2pF, C0G, 50V, $\pm 0.1$ pF, 0402	Murata, GJM1555C1H2R2BB01
3	4	C5-C8	CAP, 1000pF, X7R, 50V, 10%, 0201	Murata, GRM033R71H102KA12
4	8	C9-C16	CAP, 10nF, X7R, 50V, 10%, 0402	Murata, GRM155R71H103KA88
5	1	C17	CAP, 0.3pF, C0G, 25V, $\pm 0.05$ pF, 0201	Murata, GRM0335C1HR30WA01
6	2	C18, C19	CAP, 1 $\mu$ F, X5R, 50V, 10%, 0603	Murata, GRM188R61H105KAAL
7	2	C101, C106	CAP, 0.1 $\mu$ F, X7R, 50V, 10%, 0402	Murata, GRM155R71H104KE14
8	5	E1-E5	TEST POINT, TURRET, .064 MTG. HOLE	MILL-MAX, 2308-2-00-80-00-00-07-0
9	4	JP1-JP4	JMP, 3PIN 1 ROW .079CC	SAMTEC, TMM-103-02-L-S
10	1	JP101	HEADER, 2 $\times$ 7PIN, 0.079CC	MOLEX, 87831-1420
11	7	J1-J7	CON., SMA, 50 $\Omega$ , EDGE-LANCH	EF JOHNSON, 142-0701-851
12	8	L1-L4, L11-L14	IND., 680nH, 5%, 0603	COILCRAFT, 0603AF-681XJE
13	4	L5-L8	IND., 47nH, 2%, 0402	COILCRAFT, 0402HP-47NXGL
14	2	L9, L10	DNI	DNI
15	4	L15-L18	IND., 33nH, 2%, 0402	COILCRAFT, 0402HP-33NXGL
16	2	R101, R107	RES., 200k, 1%, 0402	Vishay, CRCW0402200KFKED
17	5	R102-R106	RES., 1k, 1%, 0402	Vishay, CRCW04021K00FKED
18	3	R108-R110	DNI	DNI
19	2	T1, T2	DNI	DNI
20	1	U1	300MHz to 6GHz Dual Programmable Gain Downconverting Mixer	Linear Tech., LTC5566IUH#PBF
21	1	U101	DNI	DNI
22	1	U102	Dual Supply Translating Transciever, 3-state	NXP, 74LVC1T45GW
23	2	U103,U104	Dual Buffer with 3-state output	FAIRCHILD, NC7WZ17P6X
24	1		CABLE ASSY., 8" STRIP	LINEAR RIBBON CABLE CA-2440

SCHEMATIC DIAGRAM

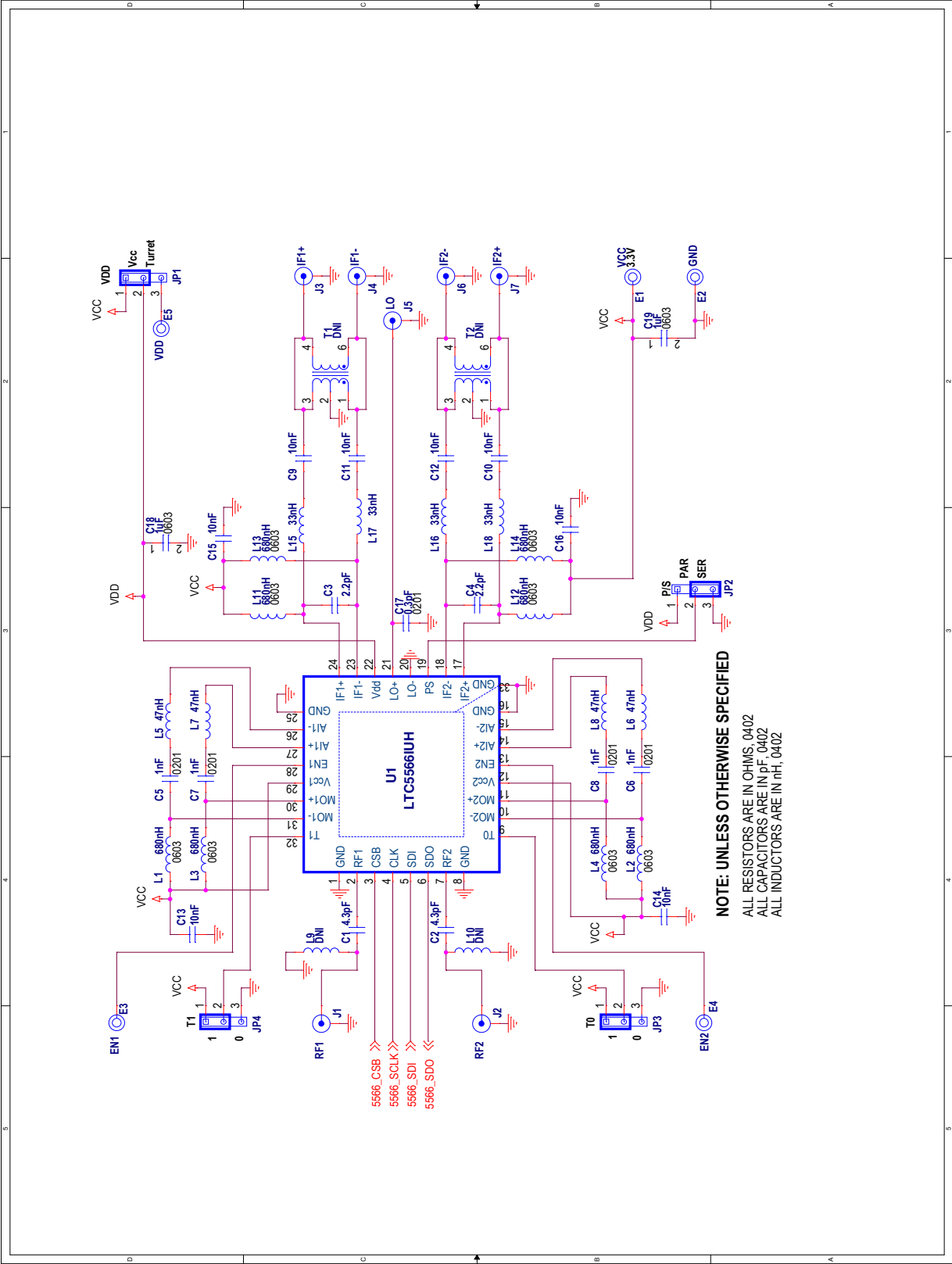


Figure 3. DC2460A Schematic Page 1



# DEMO MANUAL DC2460A

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**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.

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